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(54) **Title:** ANALYTICAL DEVICE FOR RAPID IDENTIFICATION OF PATHOGENS

(57) **Abstract:** The present invention provides an analytical device, especially a DNA microarray, for identification and characterisation of microorganisms in a sample or clinical specimen. Furthermore, it provides for a method for rapid identification and strain profiling of different microbial species in a sample or clinical specimen, especially in a blood culture, utilizing said analytical device.

Analytical device for Rapid Identification of Pathogens

The present invention provides an analytical device, especially a DNA microarray, for identification and characterisation of microorganisms in a sample or clinical specimen. Furthermore, it provides for a method for rapid identification and strain profiling of different microbial species in a sample or clinical specimen, especially in a blood culture, utilizing said analytical device.

Background

Isolation, identification and characterisation of bacteria and fungi from such diverse samples like food, environmental samples, clinical specimens, and veterinary samples is still a challenge for today´s analytical laboratories. This is due to the fact that generally the identification of microorganisms includes three steps: (a) enrichment of microorganisms by culture, (b) subculture on solid media (preparation of a pure culture), and (c) performing a set of biochemical reactions specific for a particular pathogen. All these steps are dependent on the bacterial growth (slow), they are poorly automated (lot of manual work), and complex (require well educated personal).

Isolation, identification and characterisation of bacteria and fungi from clinical specimens is a main task of microbiological routine diagnostics. In fact, microorganisms are ubiquitous in certain areas of the human body. For this reason isolation and identification of pathogenic bacteria from clinical material and discrimination of specific pathogens from contaminations with indigenous or environmentally encountered microorganisms is a requirement for the correct diagnosis of infectious diseases. Additionally, accurate identification of antibiotic resistance and particular virulence factors provide important information enabling the clinician to choose effective antimicrobial therapy.

In the course of infection, many specimen types can be used for direct identification of the pathogens. These include, but are not limited to, liquor in the course of bacterial meningitis, sputum from patients with bacterial pneumonia, urine in the course of upper and lower urinary tract infections, punktate from sites of deep purulent infections (such as abscess, phlegmone, lung emphysema and septic arthritis), stool from patients with gastrointestinal tract infections, pus, swabs or wound fluid from purulent infections of the skin and wounds. Sometimes, bacteria are represented in the specimen only in minor numbers, thus, indirect identification of pathogens after culture of specimens in liquid media is employed. Important examples are enrichment cultures of food samples during outbreaks of food borne infections and blood cultures for diagnosis of bloodstream infections.

The invasion of the bloodstream by microorganisms, especially bacteremia and fungemia, represents one of the most serious consequences of infections and is a high ranked cause of death (Mylotte, J.M. and Tayara, A., Eur. Clin. Microbiol. Infect. Dis. 19:157-163 (2000); Reimer, L.G. et al., Clin. Microbiol. Rev. 10:444-465 (1997)). Bacteremia is the means by which local infections spread hematogenously to distant organs. This hematogenous dissemination of bacteria is part of the pathophysiology of, e.g., meningitis and endocarditis, Pott's disease and many other forms of osteomyelitis. In the hospital, indwelling catheters are a frequent cause of bacteremia and subsequent nosocomial infections, since they provide a means by which bacteria normally found on the skin can enter the bloodstream. Other causes of bacteremia include dental procedures, urinary tract infections, intravenous drug use, and colorectal cancer.

Systemic fungal infection is becoming more and more common in modern hospitals. The most common fungal infections are candidiasis and aspergillosis, but other systemic fungal infections such as Histoplasmosis, Blastomycosis, Coccidioidomycosis and Cryptococcosis are also of increasing relevance. Systemic fungal infections in hospitals are commonly seen in immune compromised patients and - like bacteremia - in patients with indewelling catheters. Due to underlying serious illnesses and possible resistance of the pathogens to antifungal agents, patients with systemic fungal infections often have poor clinical outcomes. Infections due to *Candida* species are the fourth most important cause of nosocomial bloodstream infection.

Bacteremia is operationally defined as the presence of viable bacteria as evidenced by positive blood cultures. Fungemia is similarly defined as the presence of viable fungi as evidenced by positive blood cultures. When bacteremia or fungemia occurs in the presence of systemic symptoms (such as fever or chills) the condition is designated as sepsis; and in the setting of more severe disturbances of temperature, respiration, heart rate or white blood cell count, is characterised as systemic inflammatory response syndrome (SIRS).

Many septic episodes are nosocomial and often due to microorganisms with increased and multiple antimicrobial resistance. *Staphylococcus aureus*, *Escherichia coli*, Coagulase-negative staphylococci (CoNS), *Klebsiella pneumoniae*, *Pseudomonas aeruginosa*, *Enterococcus* spp., *Streptococcus* spp., *Candida albicans* and *Enterobacter cloacae* are the most frequent etiological agents of bacteremia and fungemia in Europe (Decousser, J. W. et al., J. Antimicrob. Chemother. 51:1214-22 (2003); Lyytikainen, O. et al., Clin. Infect. Dis. 35:314-9 (2002); Reacher, M.H. et al., BMJ 320:213-6 (2000); Rosenthal Kreuberger, E.J., Int. J. Antimicrob. Agents 24:196-8 (2004)) and the USA (Bourbeau, P.P. and Pohlman, J.K., J. Clin. Microbiol. 39:2079-82 (2001); Reimer, L.G. et al., Clin. Microbiol. Rev. 10:444-65 (1997); Reisner, L.G. et al., J. Clin. Microbiol. 37:2024-6 (1999); Wilson, M.L. et al., J. Clin. Microbiol. 37:1709-13 (1999)).

Nosocomial bacteremia and especially sepsis require an immediate antibiotic therapy, even when the causative bacteria are still unknown. Thus, said therapy has to be performed as empirical initial therapy (Rello, J. et al., Intensive Care Med. 20:94-98 (1994)), which covers the complete spectrum of relevant pathogens. However, the increase of bacterial resistance lowers the chance of success for such empirical antibiotic treatments considerably (Mylotte, J.M. and Tayara, A., Eur. Clin. Microbiol. Infect. Dis. 19:157-163 (2000); Weinstein, M.P. et al., Clin. Infect. Dis. 24:584-602 (1997)). This primary therapy can only be replaced by a specific treatment after a thorough microbial diagnosis which usually takes 76-120 h (Bourbeau, P.P. and Pohlman, J.K., J. Clin. Microbiol. 39:2079-2082 (2001)). A fast track diagnosis which shortens this lag time would increase the chance of therapy success.

Rapid and reliable detection of bloodstream infections, including characterisation of the pathogen to the species level and determination of its antibiotic susceptibility pattern, is crucial for several reasons: (i) Appropriate antimicrobial agents can be selected, and thus, unnecessary treatment with ineffective antibiotics can be avoided; (ii) the prognosis of the patients can be improved; (iii) the acquisition of resistances in pathogens may be decelerated and (iv) expenditures on antimicrobials and overall hospital costs can be reduced (Barenfanger, J. et al., J.

Clin. Microbiol. 37:1415-8 (1999); Doern, G.V. et al., J. Clin. Microbiol. 32:1757-62 (1994); Trenholme, G.M. et al., J. Clin. Microbiol. 27:1342-5 (1989); Wheeler, A.P. and Bernard, G.R., N. Engl. J. Med. 340:207-14 (1999)). Therefore, there is a strong need for rapid tests for specific and sensitive identification of bacteria and pathogenic fungi directly from blood cultures.

The diagnosis of bacteremia commonly relies on blood cultures where the growth of microorganisms is continuously monitored by automated devices (James, P.A. and Al-Shafi, K.M., J. Clin. Pathol. 53:231-233 (2000); Reisner, B.S. and Woods, G.L., J. Clin. Microbiol. 37:2024-2026 (1999); Wilson, M.L. et al., J. Clin. Microbiol 37:1709-1713 (1999)). Although such continuous-reading and computed systems decrease the time for detection of positive blood cultures, definitive pathogen identification from positive blood cultures still requires traditional Gram-staining, sub-culturing and susceptibility testing, delaying the identification of pathogens for one to three days (Levi, K. and Towner, K.J., J. Clin. Microbiol. 41:3890-3892 (2003); Oliveira, K. et al., J. Clin. Microbiol. 41:889-891 (2003); Oliveira, K. et al., J. Clin. Microbiol. 40:247-251 (2002); Tan, T.Y. et al., J. Clin. Microbiol. 39:4529-4531 (2001)). The subculture procedure with subsequent species identification and determination of antibiotic resistance is time-consuming and elaborate. The biochemical and immunological assays like testing with coagulase, nuclease or latex agglutination are not always reliable. Antigenic and biochemical variations of bacteria grown in blood culture, inhibitory action of blood culture medium components as well as the presence of more than one microbial species may mislead data interpretation.

Staphylococci are the most important and frequent group of pathogens growing in blood culture, responsible for 30% to more than 50% of all bacteremia events (James, P.A. and Al-Shafi, K.M., J. Clin. Pathol. 53:231-233 (2000); Reisner, B.S. and Woods, G.L., J. Clin. Microbiol. 37:2024-2026 (1999); Velasco, E. et al., Sao Paulo Med. J. 118:131-138 (2000)) with a mortality rate ranging from 13 to 50% (McClelland, R.S. et al., Arch. Intern. Med. 159:1244-1247 (1999); Rello, J. et al., Intensive Care Med. 20:94-98 (1994); Weinstein, M.P. et al., Clin. Infect. Dis. 24:584-602 (1997)). The emergence of *S. aureus* strains with multiple resistance to antibiotics makes empirical therapy prone to fail (Tan, T.Y. et al., J. Clin. Microbiol. 39:4529-4531 (2001)). *S. aureus* is generally regarded as a virulent pathogen, whereas CoNS are either considered as a cause of catheter-associated nosocomial bacteremia or, more frequently, as blood culture contamination. Thus, a sub-genus identification of gram-positive cocci in clusters (CPCC) is of great clinical significance (Oliveira, K. et al., J. Clin. Microbiol. 41:889-891 (2003)).

Methods used up to date for direct identification of *S. aureus* growing in blood culture bottles include biochemical tests, like detection of thermostable nuclease or tube coagulase test, or commercial antibody-based kits connected with the disadvantages listed above.

Besides *S. aureus* and coagulase-negative staphylococci, *E. coli, Klebsiella* spp., *Enterobacter* spp., *Proteus* spp., *Pseudomonas aeruginosa, Streptococcus pneumoniae*, beta hemolytic Streptococci and *Enterococcus* spp. belong to the most frequent reported pathogens causing bacteremia (Reimer, L.G. et al., Clin. Microbiol. Rev., 10:444-65 (1997); Reacher, M.H. et al., BMJ, 320:213-6 (2000); Lyytikainen, O. et al., Clin. Infect. Dis., 35:e14-9 (2002)) In order to reduce the time needed for identification and susceptibility testing, the possibility of combining an automated blood culture system with an automated identification and susceptibility testing system by direct inoculation from positive blood cultures has been studied for gram-positive cocci as well as for gram-negative rods by several groups of investigators, but with varying success (Reimer, L.G. et al., Clin. Microbiol. Rev., 10:444-65 (1997); Hansen, D.S. et al., Clin. Microbiol. Infect., 8:38-44 (2002); Ling, T.K. et al., J. Clin. Microbiol., 41:4705-7 (2003); Funke, G. and Funke-Kissling, P., J. Clin. Microbiol., 42:1466-70 (2004)). Although the authors saw some potential of the combined system to allow the agar isolation step to be skipped, the system is hampered by the fact that (i) the blood culture sample has to undergo a time-consuming separation procedure for the enrichment of bacterial cells, (ii) the identification rate varies depending on the employed identification system and (iii) the performance is not equally good for gram-negative and gram-positive pathogens (Reimer, L.G. et al., Clin. Microbiol. Rev., 10:444-65 (1997); Ling, T.K. et al., J. Clin. Microbiol., 41:4705-7 (2003); Funke, G. and Funke-Kissling, P., J. Clin. Microbiol., 42:1466-70 (2004)).

Considerable progress was made using nucleic acid-based methods for the identification and genotyping of bacteria or fungi in blood specimens. Assays employing ribosomal RNA-based oligonucleotide probes like fluorescence *in situ* hybridisation (FISH) (Chapin, K. and Musgnug, M., J. Clin. Microbiol. 41:4324-7 (2003); Jansen, G.J. et al., J. Clin. Microbiol. 38:814-7 (2000); Kempf, V.A. et al., J. Clin. Microbiol. 38:830-8 (2000); Oliveira, K. et al., J. Clin. Microbiol. 41-889-91 (2003)) or microarrays (Anthony, R.M. et al., J. Clin. Microbiol. 38:781-8 (2000); Marlowe, E.M. et al., J. Clin. Microbiol. 41:5127-33 (2003); Sogaard, M. et al., J. Clin. Microbiol., 43:1947-9 (2005)) provide for rapid species identification in blood cultures. However, methods solely based on ribosomal RNA probes allow species identification only, and do not provide information on antibiotic susceptibility and other strain specific characteristics (e.g. virulence genes). For the molecular detection of antibiotic resistances in staphylococci, several multiplex PCR-based assays were described (Martineau, F. et al., Antimicrob. Agents Chemother. 44:231-8 (2000); Shrestha, N.K. et al., Approved standard M2-4A, Villanova, PA (1990); Strommenger, B.C. et al. J. Clin. Microbiol. 41:4089-94; Tan, T.Y. et al., J. Clin. Microbiol. 39:4529-31 (2001)). Several groups have successfully identified *S. aureus* and more specifically methicillin-resistant *S. aureus* strains (MRSA) from blood cultures by using DNA probes (Levi, K. and Towner, K.J., J. Clin. Microbiol. 41:3890-3892 (2003); Poulsen, A.B. et al., J. Antimicrob. Chemother. 51 :419-421 (2003)), peptide nucleic acid probes (Oliveira, K. et al., J. Clin. Microbiol. 41:889-891 (2003)), multiplex PCR (Mason, W. J. et al., J. Clin. Microbiol. 39:3332-3338 (2001)), gel-based PCR (Krishnan, P.U. et al., J. Clin Pathol. 55:745-748 (2002)), and real-time PCR (Shrestha N.K. et al., J. Clin. Microbiol. 40:2659-2661 (2002); Tan, T.Y. et al., J. Clin. Microbiol. 39:4529-4531 (2001)).

However, the use of such molecular assays suffers from two main restrictions: First, they rely on a pre-identification of the pathogen since their discriminatory capacity is technically limited, for instance by the number of fluorochromes available for labelling the probes or, in the case of multiplex PCR, by the capacity of resolution in gel electrophoresis. These molecular assays are thus usually not scalable and unfit for high throughput analysis.

The last years have witnessed the emergence of many DNA microchip projects arraying genes of microorganisms (Ye, R.W. et al., J. Microbiol. Methods 47:257-272 (2001)). They can detect tens of thousands of DNA sequences in a single hybridisation step (DeRisi, J.L. et al., Science 278:680-686 (1997); Duggan, D.J. et al., Nat. Genet. 21:10-14 (1999); Lashkari, D.A. et al., Proc. Natl. Acad. Sci. USA

94:13057-13062 (1997)). Originally developed for gene expression profiling, DNA sequence analysis and genotyping, microarrays were recently also used to identify viral (Wang, R.F. et al., FEMS Microbiol. Lett. 213:175-182 (2002)) and bacterial (Bekal, S. et al., J. Clin. Microbiol. 41:2113-2125 (2003)) pathogens in environmental and clinical samples.

Most of the published reports employed oligonucleotide microarrays containing a reduced number of spotted probes and representing a single bacterial species only (Volokhov, D. et al., J. Appl. Microbiol. 95:787-798 (2003); Volokhov, D. et al., J. Clin. Microbiol. 41:4071-4080 (2003); Volokhov, D. et al., J. Clin. Microbiol. 40:4720-4728 (2002)). Such arrays were used to identify pathogenic strains belonging to a pre-identified species (Chizhikov, V. et al., Appl. Environ. Microbiol. 67:3258-3263 (2001)), to distinguish between species of the same genus (Volokhov, D. et al., J. Clin. Microbiol. 41:4071-4080 (2003); Volokhov, D. et al., J. Clin. Microbiol. 40:4720-4728 (2002)) or to detect genes encoding resistance to a certain antibiotic (Volokhov, D. et al., J. Appl. Microbiol. 95:787-798 (2003)).

Further microarrays for detection of bacteria and fungi are known in the art (Nakamura, M. et al., Abstracts of the general meeting of the American society for microbiology, abstract No C219 (2003); Wang, R.-F. et al., Molecular and Cellular Probes 223-224 (2004); Lehner, A. et al., FEMS Microbiol. Lett. 133-142 (2005); EP 1310569; WO 92/07096; US-B1-6,747,137). However, all these microarrays have in common the use of short oligonucleotides with a maximum length of 40 nt ("short oligonucleotides"). They are short-oligonucleotide microarrays. Although such short-oligonucleotide microarrays could be rapidly designed and built up they carry some intrinsic disadvantages: like all methods based on single and often short DNA sequences they show reduced reliability and sensitivity (Stears, R.L. et al., Nat. Med. 9:140-145 (2003)). To palliate the high probability of non-specific hybridisation due to the short size (20-40 bp) of the oligonucleotides it is necessary to design many partially overlapping oligonucleotides in order to confirm the presence of a gene. This consequent increase in complexity makes it extremely difficult to set up the optimal hybridisation conditions necessary for producing trustful results. Moreover, surface-bound short oligonucleotides have poor hybridisation properties and are highly sensitive to single nucleotide polymorphisms (Hughes, T.R. et al., Nat. Biotechnol. 19:342-347 (2001)). For these reasons, oligonucleotide microarrays using oligonucleotides with a maximum length of 40 nt are unsuitable for routine diagnostics.

Up to now, diagnosis of bacteremia by microarrays is limited to species identification by oligonucleotides for 23S and 18S RNA sequences, which is still strictly experimental (Anthony, R.M. et al., J. Clin. Microbiol. 38:781-788 (2000)) and carries along the methodological weakness associated to the use of short oligonucleotides as hybridisation probes.

A DNA microarray employing capture probes of more than 40 nt length amplified by PCR was described by Fitzgerald et al. (Fitzgerald, J.R. at al., Proc. Natl. Acad. Sci. USA 98(15):8821-8826 (2001)). To investigate molecular population genetics of *Staphylococcus aureus* on a genome scale, a microarray comprising 2817 complete ORFs of *S. aureus* strain COL was constructed, representing >90% of the *S. aureus* genome. The microarray was able to discriminate 36 *S. aureus* strains. However, since it was not designed for the identification of different bacterial species, it was not tested for possible cross reactions with other bacteria besides *S. aureus*. Due to the conservative nature of many house-keeping proteins and genes, respectively, cross reactions of the microarray with CoNS strains and other bacterial species will occur. Unspecific cross reactions combined with the high number of probes (2817) result in a high complexity of the microarray data, not applicable to routine diagnostics. Furthermore, PCR amplification of long ORFs is a difficult procedure, in particular for bacteria with DNA of high GC-content.

The aim of present invention is to provide a gene-segment based analytical device, especially a microarray, for species specific identification and characterisation of different microorganisms, especially different bacteria and pathogenic fungi, present in a sample or clinical specimen which does not possess the drawbacks of the short-oligonucleotide microarray as outlined above. Said device/microarray must allow the specific identification of the target species and should furthermore allow the differentiation (i.e. distinguish) between different target microorganisms present in the sample or clinical specimen. It must furthermore provide a high reliability and sensitivity of detection.

Summary of the Invention

The present invention provides an analytical device, which is preferably a DNA microarray, for the identification and characterisation of microorganisms in biological samples, especially of microorganisms connected with bacteremia, fungemia and sepsis. Species specific gene probes in this device/microarray allow the identification of different microbial species, whilst antibiotic resistance and virulence gene probes allow for the genotypic discrimination within a species. The device/microarray can be designed to allow species identification, virulence determination and resistance determination independently from each other or simultaneously, and furthermore said determinations can be performed for one or more different microbial species and strains with one device/microarray. Furthermore, different microbial species and strains are discriminated, even in a polymicrobial sample (specimen with more than one pathogen).

The device/DNA microarray according to present invention thus demonstrates the feasibility of simultaneously identifying and characterising different microbial species in a sample or clinical specimen, especially in blood samples, without prior PCR amplification of target DNA or pre-identification of the pathogen. This can reduce sample processing time to a single day and less.

The invention furthermore provides a method for rapid identification and characterisation of microorganisms, especially of bacteria, yeasts and filamentous fungi, using the device/microarray of the invention. The method is quick, can be automated, leads to reproducible results and allows an early choice of specific antibiotics for treatment of bacteremia, fungemia or sepsis.

In particular, the present invention provides

(1) an analytical device for direct identification and characterisation of microorganisms in a sample or clinical specimen, wherein the analytical device comprises species specific gene probes which are (i) selected from DNA sequences or partial DNA sequences of the microorganisms to be identified or DNA sequences complementary or homologous thereto, and (ii) have a length of at least 100 nucleotides (nt);

(2) the use of the analytical device as defined in (1) above for *in vitro* identification and characterisation of microorganisms in a sample or in a clinical specimen, preferably in a clinical specimen, more preferably for the diagnosis of a clinical condition, most preferably for the diagnosis of bacteremia, fungemia or sepsis;

(3) an *in vitro* method for identification and characterisation of microorganisms in a sample or in a clinical specimen comprising

(a) isolating the total DNA from the sample or clinical specimen and labelling the DNA with a reporter molecule, preferably a fluorochrome;

(b) applying the DNA thus obtained to the analytical device as defined in (1) above and hybridising the DNA with the gene probes of the device; and

(c) detecting DNA bound to the device by determination of the amount of the reporter molecules bound to the device; and

(4) a kit for detection of microorganisms in a sample or clinical specimen comprising the analytical device of embodiment (1).

Brief description of the Figures

Fig. 1: DNA microarray analyses of 58 clinical isolates, reference strains and blood cultures.

Each column shows the results of an individual hybridisation with target DNA prepared from: *S. aureus* ATCC 29213 (1), MW2 (2), clinical isolates (3-7), positive blood cultures (8-11); *P. aeruginosa* ATCC 27853 (12), clinical isolates (13-17), positive blood culture (18); *E. coli* ATCC 25922 (19), clinical isolates (20-25), positive blood cultures (26-27); *S. epidermidis* clinical isolates (28-32), positive blood cultures (33-35); clinical isolates of *S. auricularis* (36), *S. capitis* (37), *S. haemolyticus* (38), *S. hominis* (39), and *S. warneri* (40). Other Gram-negative species included a *Proteus mirabilis* positive blood culture (41), clinical isolates of *Proteus mirabilis* (42-43), *Serratia marcescens* (44-45), *Klebsiella pneumonia* (46-48), *Stenotrophomonas maltophilia* (49), *Acinetobacter baumannii* (50), *Enterobacter cloacae* (51) and *Enterobacter aerogenes* (52); other Gram-positive species included clinical isolates of *Micrococcus* spp. (53), *Enterococcus* spp. (54), *Enterococcus faecalis* (55) and *Streptococcus pneumoniae* (56) and two positive blood cultures of *S. pneumoniae* (57-58).

(A) Hybridisation of DNA prepared from bacterial isolates, reference strains and blood cultures with *E. coli* gene probes;

(B) hybridisation with *P. aeruginosa* gene probes;

(C) hybridisation with *S. aureus* gene probes.

Grey boxes represent gene probes which hybridised with the respective target DNA, white boxes represent gene probes which showed no hybridisation with the respective target DNA.

Fig. 2: Validation of the *S. aureus* microarray of example 1.11. 2 µg genomic DNA from *S. aureus* strain T94 were labelled either with Cy3 or Cy5, combined and hybridised as described in Example 1.11. Cy3: green signal; Cy5: red signal; double-hybridisation: yellow signal.

A) Overlay of microarray scanned using Cy3 and Cy5 filter sets;

B) Scatterplot of normalized fluorescence intensities of individual gene probes after microarray hybridisation. The signal intensities from both channels correlate highly with each other (r^2 = 0.97).

Fig. 3: Specific identification of *S. aureus* from distantly related bacteria using the microarray of example 1.11. 2 µg of *S. aureus* DNA were co-hybridised with 2 µg of pure *E. coli* (A) or *P. aeruginosa* (B) genomic DNA. Obtained hybridisation patterns are represented as bar codes, where the 140 spotted gene segments appear subsequently and are clustered in categories (NC: negative control; PC: positive control; Antibiotic Resistance Determinants; Virulence Factors and Metabolic Functions (see Tab. 6)). Positive hybridisation is indicated by a bar while negative spots are represented by an empty area. Both assays show clear *S. aureus* discrimination with practically no cross hybridisation between DNA from said gram negative bacteria and *S. aureus* selected genes, while the positive control (16S RNA sequence) reveals the good quality of hybridisation.

Fig. 4: Specific identification of *S. aureus* from coagulase negative staphylococci using the microarray of example 1.11. 2 µg of *S. aureus* DNA were co-hybridised with 2 µg of *S. epidermidis* (A) or *S. saprophyticus* (B) genomic DNA. Obtained hybridisation patterns are illustrated by scanned fluorescent picture data (A: *S. aureus*: green signal; *S. epidermidis*: red signal; B: *S. aureus*: red signal; *S. saprophyticus*: green signal) and transformed in bar codes (see legend of Fig. 3). All specific *S. aureus* virulence factor genes hybridised exclusively with *S. aureus* DNA. Yellow spots showing cross-hybridisation correspond to some shared antibiotic resistance determinants and genes associated to metabolic functions.

Fig. 5: Specificity of the *S. aureus* microarray of example 1.11.

A) Scan of microarray hybridised with 2 µg each of genomic DNA from *S. aureus* strain T103 (Cy3, represented in green) or T100 (Cy5, represented in red), showing remarkable genotypic differences between strains.

B) PCR amplification of the genes from genomic DNA of *S. aureus* (strains T100 and T103) validating results of the microarray hybridisation shown in (A).

Fig. 6: Identification and characterisation of *S. aureus* from positive blood culture using the microarray of example 1.11.
2 µg of DNA prepared from blood culture positive for *S. aureus* (strain T95) was co-hybridised with 2 µg of DNA prepared from sterile blood culture or with 2 µg of pure *S. aureus* genomic DNA for 4 hours. Positive and negative spots are transformed in a bar code scheme (see legend of Fig. 3).
Sterile blood culture DNA did not cross-hybridise with spotted *S. aureus* genes (A). Blood culture positive for *S. aureus* produced a fluorescent hybridisation pattern almost identical to the pattern obtained with pure *S. aureus* genomic DNA (B).

Fig. 7: Hybridization profiles obtained in Example 2 after microarray hybridization with DNA obtained from six bacterial target strains: (A) *S. aureus* ATCC 29213, (B) *S. epidermidis* BC 1920, (C) *S. pyogenes* DSM 11723, (D) *S. pneumoniae* ATCC 49619, (E) *E. faecalis* UW 700700/95, (F) *E. faecium* VRE9182 and two non-target strains: (G) *E. casseliflavus* UW703/95 and (H) *S. angiosus* DSM 20563.. Each bar represents the fluorescent signal of one capture probe. Fluorescent signals of the 930 probes represent the median intensity of four spots from which the local background was substracted. Probe IDs are given in Table 8.

Fig. 8: Specificity of the microarray for *Candida albicans* in Example 2. (A) Hybridization profile obtained for *C. albicans* ATCC 10231. (B) Specificity of two *C. albicans* capture probes. Hybridization signals were determined for the two probes after hybridization with DNA obtained from 44 different microbial strains (see Table 9 for strain identification).

Fig. 9: Specificity of selected capture probes for (A) *Klebsiella oxytoca*, (B) *K. pneumoniae*, (C) *Proteus vulgaris* and (D) *P. mirabilis* does allow species discrimination. Fluorescence intensities refer to hybridization signals obtained for the respective probes after hybridization with DNA isolated from 44 different microbial strains (see Table 9 for strain identification).

Fig. 10: Specificity of selected capture probes for the coagulase-negative staphylococci (A) *S. epidermidis*, (B) *S. haemolyticus*, (C) *S. warneri* and (D) *S. saprophyticus*. Fluorescence intensities refer to hybridization signals obtained for

the respective probes after hybridization with DNA isolated from 44 different microbial strains (see Table 9 for strain identification).

Definitions

In the framework of the present invention the following terms and definitions are used.

An "analytical device" in the context of present invention is any solid support onto which DNA gene probes are attached in a way permitting hybridisation of the DNA in the sample and subsequent detection of the bound DNA. This includes microtiter plates coated with one or several DNA gene probes per well, glass surfaces (like, e.g., microscopic slides) with DNA spots, filter paper disks, membranes, gold electrodes and beads (particles with a diameter of from 1 nm to several µm made of glass, plastic, metal etc.) coated with DNA, etc.. The beads may be used in a multi-chamber system, preferably in a microfluidic multi-chamber system, wherein each chamber contains a population of beads. Each bead has an attached DNA sequence and the whole beads population in one chamber will carry the same DNA sequence, each chamber corresponding then to a specific capture probe. The target DNA to be analysed flows through the multi-chamber system and will hybridize with the complementary DNA sequences attached to the beads. Beads could be also attached to a surface by magnetic force, i.e. paramagnetic beads coupled with DNA could be attached on the surface of the magnet and arrange in a lattice structure. Vice versa, beads made of a magnetic material could be attached to an iron surface.

The analytical device of present application is preferably a DNA microarray, a (magnetic) bead or set of beads coated with DNA probes or a microtiter plate coated with DNA probes. More preferred it is a (magnetic) bead or set of beads coated with DNA probes or a DNA microarray. In the most preferred aspect of present invention it is a DNA microarray.

A "DNA microarray" consists of a collection of nucleic acid sequences, preferably DNA sequences, immobilized onto a solid support, such as glass, plastic or silicon chips, in a latticed pattern (forming an "array"). Each unique sequence of said sequences forms a tiny feature on the microarray called a "spot" or "capture probe". The size of these spots varies from one system to another, but is usually less than two hundred micrometers in diameter, thus up to tens of thousands of spots can be arrayed in a total area of a few square centimeters. DNA microarrays provide a means to detect and quantify large numbers of discrete nucleic sequences in parallel. In a microarray hybridisation the nucleic acids in the sample that is being analysed (called "target") are expected to form duplexes specifically with the corresponding capture probes. Occurrence or absence of duplex formation indicate the presence or absence of said target. For routine microarray analysis, said target is commonly converted to a labelled population of nucleic acids, using reporter molecules. Hybridisation of said labelled target DNA molecules from the tested samples with complementary DNA sequences affixed in specific spots on the array can thus be detected by examination for the presence of said label on the array using a microarray scanner (Müller, H.-J., Röder, T., "Der Experimentator: Microarrays", Spektrum Akademischer Verlag, Heidelberg (2004)).

In the following, the invention is exemplified for a DNA microarray (synonym: "array"). The invention can, however, also be performed using any other of the analytical devices as listed above.

"Gene probe" or "gene probe derived from..." refers to a DNA sequence present on the microarray of present invention and used as a capture probe. It is a DNA segment (see below) which is complementary to a target DNA sequence, preferably to a microbial, more preferably to a bacterial or fungal gene or gene segment. Said gene probe is prepared by any known method of DNA synthesis, and preferably prepared by cloning the respective PCR-amplified gene or gene segment into a plasmid/vector. The recombinant gene or gene segment is then amplified by PCR, isolated from the amplification mix, purified (preferably by ethanol-purification) and finally spotted onto the array.

An "isolate" is a microbial, especially a fungal or bacterial strain isolated from a given specimen, wherein the isolation includes at least one *in vitro* propagation.

A "clinical isolate" is an isolate from a clinical specimen.

"Coagulase-negative staphylococci" ("CoNS") are bacteria of the genus Staphylococcus which are negative for a bacterial coagulase (do not induce clotting of a serum). These are all Staphylococci with the exception of *S. aureus*. Preferred CoNS in the context of present invention are *Staphylococcus epidermidis,* *Staphylococcus haemolyticus, Staphylococcus lugdunensis* and *Staphylococcus warneri*, of which *Staphylococcus epidermidis* is especially preferred.

An "isolated DNA" is a DNA separated or purified from the organism it is naturally associated with or from the clinical specimen in which it occurs. This comprises biochemically or biophysically purified native DNA, recombinant DNA, chemically synthesized DNA and DNA analogues (e.g. peptide nucleic acids).

"Native" is synonymous to "naturally (occuring)".

A "DNA segment" or "gene segment" is an isolated DNA which contains or consists of a part of the native full-length sequence of a gene which is still able to hybridize to the native sequence under stringent hybridisation conditions. Although the present invention is in the following exclusively described as relating to "DNA" sequences, it is not to be construed as being limited thereto. Rather, if the term "DNA" is used in connection with the gene probes or target sequences of present invention, it includes other polynucleotides (like RNA or RNA/DNA hybrids), and DNA analogues such as PNA, phosphonate backbone DNA, artificial pentose or hexose backbone DNA which is able to hybridize with native DNA etc.. Furthermore, modified bases like deoxy bases, inosine or aminoallylcytosine may be used on all DNA, RNA and PNA backbones. However, DNA itself is the preferred polynucleotide for performance of the invention.

The DNA sequences used as gene probes in present invention are either identical, substantially identical or homologous to the complementary native target sequences (i.e. they are "derived from" said target sequences). In the context of present invention, when a specific DNA sequence is denominated, this encompasses not only said specific sequence, but also the sequences substantially identical or homologous thereto, i.e. its substitution mutants. "Substantially identical" means that the DNA contains mutations of up to 10% of the total number of nt in comparison with the native DNA sequence and/or has a nucleotide identity of > 90% to the corresponding native DNA segment. Said mutations are preferably single nucleotide polymorphisms or point mutations and include the mutation of not only a single but also a few (up to 10 nt, preferably up to 5 nt) consecutive nt. "Homologous" or "homologue" refers to a DNA sequence which has a sequence identity of more than 70% of the corresponding native DNA sequence and encompasses the substantially identical DNA sequences. Preferably, the sequences used as gene probes are at least substantially identical to the corresponding native DNA sequence.

Preferred gene probes of the present invention are the DNA sequences listed in the sequence protocol, their complementary sequences or their corresponding native DNA segment.

The DNA sequences used as gene probes in present invention may also be deletion or addition mutants of the corresponding native DNA segments. In case of deletion mutants, the minimum length of the DNA sequences suitable as probes in present invention is 100 nt. Preferably, the deletions take place at the 5´- and/or 3´-terminus of the native DNA segment. In case of addition mutants, the added nucleotides may sum up to a total of 90% of the nucleotide number of the native DNA segment, if added at the 5´- or 3´-terminus of the DNA sequence. Alternatively, the additions and deletions may be of one isolated nucleotide or of 2 or more consecutive nucleotides at one or more internal site(s) of the native DNA segment. Preferably, 0-30% nucleotides of the corresponding native DNA segment are added or deleted. It is most preferred that the addition or deletion mutants used as gene probes in present invention comprise one or more segment(s) of at least 100 consecutive nt each, which are derived from one gene, and/or sequences homologous (70% homology) or complementary thereto. These segments may be embedded in or fused to other DNA sequences, which will not hybridize under stringent conditions with either human or bacterial DNA or the DNA of the target microorganism. Said other DNA sequences preferably have a maximum length which adds up with the length of the enclosed segment(s) to not more than the upper limit for the length of gene probes suitable for present invention.

A "positive blood culture" is an *in vitro* culture started from whole blood or blood components wherein the growth of microorganisms has been detected. Said growth is indicated by a positive growth index. The detection is preferably done by monitoring CO_2 production in the blood culture.

"Direct identification" of microorganisms refers to an identification method which comprises isolation of DNA from a sample or clinical specimen, but does not require an amplification of the genetic material of the microorganisms after said isolation in order to identify the microorganisms using the method of present invention. The isolated genetic material is labelled and applied to the DNA microarray of present invention without prior amplification, i.e. directly after isolation or after a short workup step.

„Species-specific" probe(s) means that a species can be identified specifically and unambiguosly using said probe or set of probes.

"Differentiation" means the discrimination among distinct and different species, genera or groups of pathogens.

A "detection method" in the context of the present invention is a method for determination of hybridisation of DNA molecules contained in a sample to the probes on the solid support of the microarray of present invention. This method may be any textbook method for detection of DNA hybridisation on microarrays, e.g. direct detection or labelling of target DNA with a reporter molecule and consecutive visualisation of the reporter molecule. Preferred detection methods are said labelling method and the direct detection by electrical biosensors or mass spectrometry (Liu, R. H. et al., Anal. Chem. 76(7):1824-31 (2004); Stomakhin, A. A. et al., Nucleic Acids Res. 28(5):1193-8 (2000)).

A "reporter molecule" in the context of the method of the present invention is a chemical or physical marker which allows differentiation of labelled from unlabelled DNA by physical, chemical or immunological methods. The labelling method includes, but is not limited to radioactive labelling (e.g. with ^{33}P, ^{32}P), fluorescent/luminescent/chromophor labelling and hapten labelling (i.e. psoralen or DIG). It is followed by an appropriate detection step necessary to determine the presence and/or quantity of the reporter molecule, namely scintillation counting (e.g. phosphoimaging); photooptic measurement (e.g. fluorescence measurement, luminescence measurement) and antibody-based detection (including colorimetric, luminescence or fluorescence detection), respectively. Preferably, the reporter molecule is a fluorochrome/fluorophor (both terms are used as synonyms in the context of present invention) which includes but is not limited to cyanines, fluoresceins and rhodamines. More preferably, it is of the cyanine group of fluorophores. Most preferably, it is selected from the group consisting of the fluorophores Cy3, Cy5 or Alexa Fluor 647 and Alexa Fluor 546. The ratio of base to dye molecules (BDR) in DNA labelled with such reporter molecules is preferably less or equal to 60.

A "target species" is a species for which species-specific capture probes are present in the microarray, allowing species identification by positive hybridisation. "Non-target species" are all other species.

Detailed description of the invention

The present invention provides an analytical device, preferably a DNA microarray, and its use for rapid identification and characterisation of microorganisms in a sample or clinical specimen (embodiments (1) to (3)). The invention is exemplified in the following by the most preferred embodiment of the analytical device (1), namely a DNA microarray. The invention can, however, also be performed using any other of the analytical devices as listed above. Thus, unless otherwise stated, in the following the term "DNA microarray of embodiment (1)" is to be understood as "analytical device of embodiment (1)".

The DNA microarray of embodiment (1) of the invention comprises gene specific DNA sequences as capture probes, which allow the identification of microbial species ("target species"), especially of bacterial and fungal species, and/or their further characterisation with regard to antibiotic resistance and virulence. Preferably, it allows the identification and characterisation of the target species. It is specific, applicable to the analysis of DNA isolated from blood cultures and suitable to detect resistance genes.

The DNA microarray of embodiment (1) comprises at least 1 species specific probe per target species. In a preferred aspect of the invention, it additionally comprises one or more virulence and/or resistance gene probe(s).

A further preferred aspect of embodiment (1) is that the DNA microarray comprises species specific probes for more than one or multiple microbial species, i.e. for a plurality of species. The DNA microarray of this preferred aspect of embodiment (1) allows the simultaneous detection of a plurality of microbial species in a sample without previous isolation and/or amplification of single species. It furthermore allows a one-step determination of whether certain microorganisms are present in a sample or not, even if the sample comprises a plurality of different microbial strains.

One important feature of the microarray of the present invention is that the panel of probes can be continually extended to include sequences for additional species, variant isolates or antibiotic resistance determinants as they are characterised and available. The accuracy, range and discriminatory power of the gene-segment based microarray can be refined by adding or removing gene probes to the panel without significantly increasing complexity or costs. In a pilot study, three important species causing bacteremia were selected to provide a proof of principle (examples 1.1-1.10). The range of organisms that can be identified can be easily expanded by increasing the number of gene probes on the array. For example, addition of a few probes specific for *S. epidermidis* and other CoNS will allow for the species identification of coagulase-negative staphylococci. Furthermore, due to a specific hybridisation pattern for each species it will also allow the identification of mixed blood cultures with more than one pathogen.

A second important feature of this microarray format is the length of the DNA sequences used as gene probes. They are at least 100 nt, preferably 100-3000 nt long. In an especially preferred aspect of embodiment (1) the length of the gene probes is from 100 to 1000 nt, most preferably from 200 to 800 nt. Thus, one probe per gene is usually sufficient to produce strong signals and high specificity (Stears, R.L. et al., Nat. Med., 9:140-5 (2003)). For long probes like these, minor point mutations are likely to only slightly reduce duplex formation, which does not lead to the loss of hybridisation signals. In contrast, short oligonucleotide microarrays sometimes lack specificity and require multiple short oligonucleotides per one gene.

The microorganisms or microbial DNA to be detected using the microarray of present invention are preferably bacteria (such as *Staphylococci, Enterococci, Streptococci, E. coli, P. aeruginosa, Klebsiella* spp., *Proteus* spp., *Enterobacter* spp., *Acinetobacter* spp. and *Stenotrophomonas* spp.) or fungi (such as yeasts and filamentous fungi, in particular *Candida* spp., *Aspergillus* spp., *Cryptococcus* spp., *Malassezia* spp., *Trichosporin* spp.), respectively bacterial or fungal DNA. The microarray is especially suitable for direct identification and characterisation of bacteria and *C. albicans*.

In a preferred aspect of embodiment (1) the analytical device is suitable for species specific identification of one microbial strain or (preferably) a plurality of microbial strains in clinical specimens comprising microbial strains, especially bacteria and/or fungi. It furthermore allows differentiation of the target species from each other and from non-target-species contained in one sample comprising a plurality of microbial strains.

In one preferred aspect of embodiments (1), (2) and (3), the DNA microarray is feasible to identify and characterize any of the microorganisms, including the fungi and bacteria as defined above, known as etiological agents of fungemia, bacteremia or sepsis. In another preferred aspect of (1), it is feasible to characterize the bacteria known as etiological agents of bacteremia or sepsis. More preferably, it is feasible to identify and characterize at least 90 % of said microorganisms or bacteria. Equally more preferably it is feasible to identify and characterize microorganisms selected from the group consisting of *S. aureus, Coagulase-negative staphylococci, Enterococci, Streptococci, E. coli, Klebsiella* spp., *Proteus* spp, *P. aeruginosa, Acinetobacter* spp. and *Candida albicans*, most preferably microorganisms selected from the group consisting of *S. aureus,* CoNS (including *Staphylococcus epidermidis, Staphylococcus haemolyticus, Staphylococcus lugdunensis, Staphylococcus warneri, Staphylococcus saprophyticus, Staphylococcus hominis*), *C. albicans, Enterococcus faecalis, Enterococcus faecium, E. coli, Klebsiella oxytoca, Klebsiella pneumoniae, Proteus mirabilis, Proteus vulgaris, P. aeruginosa, Acinetobacter baumannii, Streptococcus agalactiae, Streptococcus bovis, Streptococcus mutans, Streptococcus pneumoniae, Streptococcus pyogenes*.

In a first most preferred aspect of embodiment (1), the DNA microarray is suitable for species specific identification of microorganisms selected from the group consisting of Staphylococci, *E. coli* and Candida sp., preferably for species specific identification of Staphylococci, especially of *S. aureus*. More preferably, it is suitable for species specific identification of Staphylococci and at least one of *E. coli* and *Candida albicans*.

In a second most preferred aspect of embodiment (1), the DNA microarray is suitable to identify and characterize at least *S. aureus, Coagulase-negative staphylococci, E. coli, Enterococcus faecalis* and *faecium* and *Candida albicans*.

In addition to above aspects, the DNA microarray is in a preferred embodiment of present invention suitable for additional species specific identification or differentiation of *Klebsiella pneumoniae, Klebsiella oxytoca, Streptococcus* *pneumoniae, Streptococcus pyogenes, Pseudomonas aeruginosa, Proteus mirabilis* and/or *Proteus vulgaris.*

The practicability and specificity of the DNA microarray for the identification and characterisation of *Staphylococcus aureus*, *Escherichia coli* and *Pseudomonas aeruginosa* was evaluated with clinical isolates and positive blood cultures (Examples 1.1-1.10). Especially preferred is a microarray which allows identification and characterisation of *S. aureus*. The latter microarray allows the detection of every *S. aureus* isolate, unambiguously identifies most of important virulence genes such as *tsst-1, sea, seb, eta* and antibiotic resistance genes such as *mecA, aacA-aphD, blaZ, ermA* and specifically distinguishes *S. aureus* from unrelated gram negative bacteria, e.g. *Escherichia coli* or *Pseudomonas aeruginosa,* as well as from closely related CoNS (Example 1.11, Fig. 2-6).

In another preferred aspect of the invention, the microarray of (1) is suitable for diagnosis of fungemia, bacteremia or sepsis; especially for diagnosis of bacteremia, candidemia, and bacterial or *Candida* sepsis.

The present invention provides a novel approach for detection of microorganisms, especially of bacteria and fungi, by microarrays: using gene-segments it allows species identification by probing a large and diverse set of species-specific genes. Such an approach is reliable since it makes possible to identify a pathogen even when some genes have been deleted from its genome. Furthermore, the selected DNA probes are at least 100 nt, preferably 200 to 800 nt long and are therefore not sensitive to single nucleotide polymorphisms or CG-content variations in the targets. Therefore, a gene segment array according to present invention is useful for indicating the presence of a gene even though the sequence may be slightly altered e.g. by point mutations (Southern, E. et al., Nat. Genet. 21:5-9 (1999)). Additionally, it permits species virulence and antibiotics resistance profiling all together in a single-step test. Thus, present invention provides for a significant improvement compared to the classical approach focused on the detection of a short evolutionary conserved sequence like 16S RNA.

The number and perfect composition of gene-segments necessary for a correct species identification, virulence determination and resistance profiling must be determined by empiric specificity tests. Thus, in a preferred aspect of the invention, the DNA microarray of embodiment (1) comprises the minimal number of species specific gene probes which is sufficient for species identification, the minimal number of virulence gene probes which is sufficient for virulence determination, and/or the minimal number of resistance gene probes which is sufficient for determination of resistance of a specific microorganism. Preferably, the minimal number of gene probes in this aspect of the invention is: for correct species identification at least 1 species specific gene probes per target species, more preferably at least 2 different species specific gene probes per target species, even more preferably at least 10, most preferably at least 20; for virulence determination at least 1 gene probe per target species, more preferably at least 5 different gene probes, even more preferably at least 20 different gene probes, most preferably gene probes for all known virulence factors of each target species; for determination of resistance at least 1 gene probe per antibiotic class or resistance factor, more preferably at least 5 different gene probes, most preferably all known gene-coded resistance determinants in the target species.

Generally, the DNA microarray of embodiment (1) comprises gene probes which are specific for a microbial species, bacterial/fungal species or a group of microorganisms to be identified. Said gene probes are preferably DNA sequences selected from three different groups, namely (a) species specific gene probes; (b) virulence gene probes; and/or (c) resistance gene probes.

Preferably, the species specific set of gene probes for each species to be identified and characterised is selected from species specific gene probes (a) for

(i) *Staphylococcus aureus* including gene probes derived from *clfA, clfB, coa, lytM, NAG, sodA, sodB, epiP-bsaP, geh, hemC, hemD, hsdS, lip, menC, nuc, SAV0431, SAV0440, SAV0441, spa, ebpS, fbpA, fib, fnbB, srtA, stpC, fnbA, femA, fmhB, fmhA;*
(ii) *Escherichia coli* including gene probes derived from *b1169, fliCb, nfrB, yacH, ycdS, yciQ, shuA*;
(iii) *Staphylococcus epidermidis* including gene probes derived from *ardeSE0106, ardeSE0107, atlE, agrB, alphSE1368, gad, glucSE1191, icaB, mvaSSepid, nitreSE1972, nitreSE1974, nitreSE1975, oiamtSE1209, ORF1Sepid, ORF3bSepid, qacR, ureSE1865, ureSE1867;*
(iv) *Staphylococcus haemolyticus* including gene probes derived from *femBShaemolyt, mvaDShaemolyt, mvaSShaemolyticus, RNApolsigm;*

(v) *Staphylococcus lugdunensis* including gene probes derived from *agrB2Stalugd, agrC2Stalugd, slamStalugd;*

(vi) *Staphylococcus warneri* including gene probes derived from *msrw1Stwar, nukMStwar, proDStwar, proMStwar, sigrpoStwar, tnpStwar;*

(vii) *Staphylococcus saprophyticus* including gene probes derived from *RNApolsigmSsapro;*

(viii) *Staphylococcus hominis* including gene probes derived from *ydhK;*

(ix) *Candida albicans* including gene probes derived from *ARG56, ASL43f, BGL2, CCT8, CDC37, CEF3, CHS1, CHS2, CHS4, CHS5, CHT1, CHT2, CHT4, CSA1, 5triphosphatase, AAF1, ADH1, ALS1, ALS7, EDT1, ELF, ESS1, FAL1, GAP1, GNA1, GSC1, GSL1, HIS1, HTS1, HWP1, HYR1, INT1a, KRE15f, KRE6, KRE9, MIG1, MLS1, MP65, NDE1, PFK2, PHR1, PHR2, PHR3, PRA1, PRS1, RBT1, RBT4, RHO1, RNR1, RPB7, RPL13, RVS167, SHA3, SKN1, SRB1, TCA1, TRP1, YAE1, YRB1, YST1exon2;*

(x) *Enterococcus faecalis* including gene probes derived from *arcA, arcC, bkdA, camE1, csrA, dacA, dfr, dhoD1a, ABC-eltA, agrBfs, agrCfs, dnaE, ebsA, ebsB, eep, efaR, gls24_glsB, gph, gyrAEf, metEf, mntHCb2, mob2, mvaD, mvaE, parC, pcfG, phoZ, polC, ptb, recS1, rpoN, tms, tyrDC, tyrS;*

(xi) *Enterococcus faecium* including gene probes derived from *bglB, bglR, bglS, efmA, efmB, efmC, mreC, mreD, mvaDEfaecium, mvaEEfaecium, mvaK1Efaecium, mvaK2Efaecium, mvaSEfaecium, orf3_4Efaeciumb, orf6_7Efaecium, orf7_8Efaecium, orf9_10Efaecium;*

(xii) *Klebsiella pneumonia* including gene probes derived from *atsA, budC, citA, citW, citX, dalK, acoA, acoB, acoC, ahlK, fimK, glfKPN2, ltrA, mdcC, mdcH, nifF, nifK, nifN, tyrP, wbbO, wzb, wzmKPN2, wztKPN2, yojH, liac;*

(xiii) *Klebsiella oxytoca* including gene probes derived from *gatY, pelX, tagH, tagK, tagT;*

(xiv) *Pseudomonas aeruginosa* including gene probes derived from *glpR, lasRb, OrfX, pa0260, pa0572, pa0625, pa0636, pa1046, pa1069, pa1846, pa3866, pa4082, pilAp, PilAp2, pilC, PstP, uvrDII, vsmI, vsmR, xcpX;*

(xv) *Streptococcus pneumoniae* including gene probes derived from *cap1EStrpneu, cap1FStrpneu, cap1GStrpneu, cap3AStrpneu, cap3BStrpneu, celAStrpneu, celBStrpneu, cglAStrpneu, cglBStrpneu, cglCStrpneu, cglDStrpneu, cinA, cps14EStrpneum, cps14FStrpneum, cps14GStrpneum, cps14HStrpneum, cps19aHStrpneum, cps19aIStrpneum, cps19aKStrpneum, cps19fGStrpneum,* *cps23fGStrpneum, dexB, dinF, 1760Strpneu, acyPStrpneu, endAStrpneu, exoAStrpneu, exp72, fnlAStrpneu, fnlBStrpneu, fnlCStrpneu, gct18Strpneum, hexB1, hftsHstrpneu, immunofrag1Strpneu, immunofrag2Strpneu, immunofrag3Strpneu, kdtBStrpneu, lysAStrpneu, pcpBStrpneu, pflCStrpneu, plpA, prtA1Strpneu, pspC1Strpneu, pspC2, purRStrpneu, pyrDAStrpneum, SP0828Strpneu, SP0830Strpneu, SP0833Strpneu, SP0837_38Strpneu, SP0839Strpneu, ugdStrpneu, uncC, vicXStrepneu, wchA6bStrpneum, wci4Strpneum, wciK4Strpneum, wciL4Strpneum, wciN6bStrpneum, wciO6bStrpneum, wciP6bStrpneum, wciY18Strpneum, wzdbStrpneum, wze6bStrpneum, wzy18Strpneum, wzy4Strpneum, wzy6bStrpneum, xpt;*

(xvi) *Streptococcus agalactiae* including gene probes derived from *cpsA1Strgal, cpsB1Strgal, cpsC1Strgal, cpsD1Strgal, cpsE1Strgal, cpsG1Strgal, cpsIStragal, cpsJStragal, cpsKStragal, cpsMStragal, cpsYStragal, cylBStraga, cylEStraga, cylFStraga, cylHStraga, cylIStraga, cylJStraga, cylKStraga, 0487Straga, 0488Straga, 0493Straga, 0495Straga, 0498Straga, 0500Straga, 0502Straga, 0504Straga, folDStraga, neuA1Strgal, neuB1Strgal, neuC1Strgal, neuD1Strgal, recNStraga, ileSStraga;*

(xvii) *Streptococcus pyogenes* including gene probes derived from *cyclStrpyog, fah_rph_hlo_Strpyog, int, int315.5, oppD, SPy0382Strpyog, SPy0390Strpyog, SpyM3_1351, vicXStrpyog;*

(xviii) *Streptococcus mutans* including gene probes derived from *573Stprmut, 580SStprmut, 581_582SStprmut, 584SStprmut, dltAStrmut, dltBStrmut, dltCppx1Strmut, dltDStrmut, lichStrbov, lytRStprmut, lytSStprmut, pepQStrrmut, pflCStrmut, recNStprmut, ytqBStrmut;*

(xix) *Proteus mirabilis* including gene probes derived from *atfA, atfB, atfC, ccmPrmi1, cyaPrmi, flfB, flfD, flfN, flhD, floA, ftsK, gstB, hemCPrmi, hemDPrmi, hev, katA, lpp1, menE, mfd, nrpA, nrpB, nrpG, nrpS, nrpT, nrpU, pat, pmfA, pmfC, pmfE, ppaA, rsbA, rsbC, speB, stmA, stmB, terA, terD, umoA, umoB, umoC, ureR, xerC, ygbA;*

(xx) *Proteus vulgaris* including gene probes derived from *envZPrvu, frdC, frdD, lad, tna2;*

(xxi) *Acinetobacter baumanii* including gene probes derived from carO, gacS, dhbA, dhbB, sid, csuD, csuC, tnp-ACIBA, waaA-ACIBA, csuB, csuA_B, csuA, put1, por, abc, furACIBA, dec, cysI, trpE, put3, ompA-ACIBA.

Preferably, the virulence specific set of gene probes for each species to be identified and characterised is selected from virulence gene probes (b) for

(i) *Staphylococcus aureus* including gene probes derived from *bsaE, bsaG, cap5h, cap5i, cap5j, cap5k, cap8H, cap8I, cap8J, cap8K, I-hld, I-hysA, I-IgGbg, EDIN, eta, etb, hglA, hglB, hglC, hla, hlb, lukF, lukS, NAG, sak, sea, seb, sec1, seg, seh, sel, set15, set6, set7, set8, sprV8, tst, I-sdrC, I-sdrD, I-sdrE;*

(ii) *Escherichia coli* including gene probes derived from *b1202, eae, eltB, escR, escT, escU, espB, fes, fteA, hlyA, hlyB, iucA, iucB, iucC, papG, rfbE, shuA, SLTII, toxA-LTPA, VT2vaB;*

(iii) *Staphylococcus epidermidis* including gene probes derived from *gcaD, hld_orf5, icaC, icaD, icaR, psm_beta1and2, purR, spoVG, yabJ;*

(iv) *Staphylococcus haemolyticus* including gene probes derived from *lipShaemolyt;*

(v) *Staphylococcus lugdunensis* including gene probes derived from *fblStalugd, slushABCStalugd;*

(vi) *Staphylococcus warneri* including gene probes derived from *gehAStwar;*

(vii) *Candida albicans* including gene probes derived from *CCN1, CDC28, CLN2, CPH1, CYB1, EFG1, MNT1, RBF1, RBF1, RIM101, RIM8, SEC14, SEC4, TUP1, YPT1, ZNF1CZF1;*

(viii) *Enterococcus faecalis* including gene probes derived from *asa1, asp1, cgh, cylA, cylB, cylI, cylL_cylS, cylM, ace, ef00108, ef00109, ef0011, ef00113, ef0012, ef0022, ef0031, ef0032, ef0040, ef0058, enlA, esa, esp, gelE, groEL, groES, rt1, sala, salb, sea1, sep1, vicK, yycH, yycI, yycJ;*

(ix) *Enterococcus faecium* including gene probes derived from *entA_entI, entD, entR, oep, sagA;*

(x) *Klebsiella pneumonia* including gene probes derived from *cim, aldA, hemly, pSL017, pSL020, rcsA, rmlC, rmlD, waaG, wbbD, wbbM, wbbN, wbdA, wbdC, wztKpn, yibD;*

(xi) *P. aeruginosa* including gene probes derived from *aprA, aprE, ctx, algB, algN, algR, ExoS, fpvA, lasRa, lipA, lipH, Orf159, Orf252, pchG, PhzA, PhzB, PLC, plcN, plcR, pvdD, pvdF, pyocinS1, pyocinS1im, pyocinS2, pys2, rbf303, rhlA, rhlB, rhlR, TnAP41, toxA;*

(xii) *Streptococcus pneumoniae* including gene probes derived from *igaStrpneu, lytA, nanA, nanBStrpneu, pcpCStrpneu, ply, prtAStrpneu, pspA, SP0834Strpneu, sphtraStrpneu, wciJStrpneu, wziyStrpneu, wzxStrpneu;*

(xiii) *Streptococcus agalactiae* including gene probes derived from *CAMPfactor, 0499Straga, hylStragal, lipStragal;*

(xiv)*Streptococcus pyogenes* including gene probes derived from *DNaseIStrpyog, fba2Strpyog, fhuAStrpyog, fhuB1Strpyog, fhuDStrpyog, fhuGStrpyog, hylA, hylP, hylp2, oppB, ropB, scpAStrpyog, sloStrpyog, smez- Strpyog, sof, speA, speB2Strpyog, speCStrpyog, speJStrpyog, srtBStrpyog, srtCStrpyog, srtEStrpyog, srtFStrpyog, srtGStrpyog, srtIStrpyog, srtKStrpyog, srtRStrpyog, srtTStrpyog, vicKStrpyog;*

(xv) *Streptococcus mutans* including gene probes derived from *hlyXStrmut, perMStrmut;*

(xvi) *Proteus mirabilis* including gene probes derived from *flaA, laD, fliA, hpmA, hpmB, lpsPrmi, mrpA, mrpB, mrpC, mrpD, mrpE, mrpF, mrpG, mrpH, mrpI, mrpJ, patA, putA, uca, ureDPrmi, ureEPrmi, ureFPrmi, zapA, zapB, zapD, zapE.*

Preferably, the resistance specific set of gene probes is selected from resistance gene probes (c) derived from genes coding for

(i) beta-lactams resistance including gene probes derived from *blaIMP-7, mecISepid, blaOXA-10, blaB, ampC, I-blaR, blaOXA-32, bla-CTX-M-22, pbp2aStrpneu, blaSHV-1, blaOXA-2, blaRShaemolyt, blaIMP-7, I-mecR, blaOXY, dacCStrpyog, mecA, blaIShaemolyt, blavim, pbp2b, pbp2primeSepid, pbp2x, pbp3Saureuc, pbp4, pbp5Efaecium, pbpC, I-mecI, pbp1a, I-blaI, blaTEM-106, blaOXY-KLOX, ftsWEF, cumA, blaPER-1, bla_FOX-3, blaA, psrb, mecR1Sepid, blaZ, blaOXA-1, fox-6, blaPrmi;*

(ii) aminoglycosides resistance including gene probes derived from *aacA_aphDStwar, aacC1, aacC2, strB, aadA, aadB, aadD, aacA4, strA, aph-A3, aacC1, aacA4, aacA-aphD, I-spc, aphA3; aacA4ENCL, aac(6p)-lb7;*

(iii) macrolides-lincosamines-streptogramins resistance including gene probes derived from *ermC, linB, satSA, mdrSA, I-linA, ermB, ermA, satA, msrA, mphBM, mefA, mrx;*

(iv) trimethoprim resistance including gene probes derived from *dfrA, dfrStrpneu;*

(v) chloramphenicol resistance including gene probes derived from *cat, catEfaecium, cmlA5;*

(vi) tetracyclines resistance including gene probes derived from *tetAJ, tetL, tetM;*

(vii) glycopeptides resistance including gene probes derived from *vanH(tn), vanA, vanHB2, vanR, vanRB2, vanS(tn), vanSB2, vanWB2, ddl, ble, vanXB2, vanY(tn), vanYB2, vanB, vanZ(tn), vanC-2, vanX(tn);*

(viii) multiple target resistance including gene probes derived from *acrB, mexB, I-qacA, sulI, sul, cadBStalugd, mexA, acrR, emeA, acrA, rtn, abcXStrpmut, qacEdelta1, elkT-abcA, I-cadA, albA, wzm, msrCb, nov, wzt, wbbl, norA23, mexR, arr2, mreA, I-cadC, uvrA, AdeR-ACIBA, adeA-ACIBA, adeB-ACIBA, adeC-ACIBA, AdeS-ACIBA;*

(ix) fungicides resistance, especially *C. albicans* fungicide resistance, including gene probes derived from *CRD2, CDR1, MET3, FET3, FTR2, MDR1-7, ERG11, SEC20.*

Most preferably, the resistance specific set of gene probes is selected from resistance gene probes (c) derived from genes coding for

(i) beta-lactams resistance including gene probes derived from *bla-CTX-M-22, blaSHV-1, blaTEM-106, mecA, blaZ;*

(ii) aminoglycosides resistance including gene probes derived from *aacC1, aacC2, aadA, aadB, aadD, aacA4, aph-A3, aacC1, aacA4, aacA-aphD, aphA3;*

(iii) macrolides-lincosamines-streptogramins resistance including gene probes derived from *ermA, ermB, ermC;*

(iv) tetracyclines resistance including gene probes derived from *tetAJ, tetL, tetM*

(vii) glycopeptides resistance including gene probes derived from *vanA, vanB, vanC-2.*

The most relevant resistance gene probes are probes derived from and specific for *mecA.* This is due to the fact that *mecA* is common to all Staphylococci including *S. aureus* and CoNS.

Since the same resistance phenotype is determined by many different genotypes, it is preferred to use a plurality of resistance gene probes for unambiguous and comprehensive prediction of antibiotic resistance. The largest available set of resistance probes is most preferred.

For the virulence assessment of a certain strain and the sub-species strain discrimination, it is preferred to use a plurality of virulence gene probes for unambigous and comprenehsinve virulence determination. The use of the highest available number of genotypic markers is most favourable.

Furthermore, the microarray may contain a set of gene probes which serve as controls. Preferably, such a set of control gene probes is selected from group (d) consisting of control gene probes coding for

(i) negative controls, namely DNA sequences which will not hybridise with human DNA or bacterial, fungal or the microbial target DNA under the hybridisation conditions of the method of present invention, including gene probes derived neither from fungal, bacterial or target microbial nor from human genes, preferably gene probes derived from plant genes, more preferably from *Arabidopsis thaliana* or *Glycine max* genes;

(ii) positive controls including segments of ribosomal DNA from bacterial target species, preferably 16S DNA, and segments of conserved human genes;

(iii) positive controls specific for DNA added to the sample ("spiked DNA"), namely DNA sequences which will not hybridise with human DNA or the fungal, bacterial or microbial target DNA under the hybridisation conditions of the method of present invention, including gene probes derived neither from fungal, bacterial or target microbial nor from human genes, preferably gene probes derived from mouse or amoeba genes, most preferably from *Mus musculus* or *Dictyostelium discoideum* genes.

These control gene probes are necessary to

a) detect non-specific hybridisation;
b) optimise hybridisation conditions and image acquisition and analysis;
c) provide positive controls for the quality of probe preparation, hybridisation and detection; and/or
d) control technical aspects of the entire detection procedure including labelling, hybridisation and detection steps.

In a preferred aspect of embodiment (1), the microarray contains DNA sequences selected from the group consisting of the SEQ ID NOs: 1-918 and 2842-2908, complementary sequences thereto, addition mutants, deletion mutants, substitution mutants and homologues thereof as gene probes.

More preferably, in order to identify a specific microbial species, bacterial species or group of bacteria, the gene probes of group (a) are selected from SEQ ID NO:1-99, 142-152, 174-199, 209-214, 216-219, 222-229, 231-291, 308-342, 377-393, 399-431, 449-490, 523-591, 606-639, 645-656, 687-701, 706-749, 776-781, 2843-

2863, 2902 and 2903 (compare Tab. 1). Equally, in order to determine virulence of a specific micororganism or bacterial species, the gene probes of group (b) are selected from SEQ ID NO: 100-141, 153-173, 200-208, 215, 220-221, 230, 292-307, 343-376, 394-398, 432-448, 491-522, 592-605, 640-644, 657-686, 702-705, 750-775 and 782-784 (compare Tab. 1). Equally, in order to determine antibiotic resistance of a specific microbial or bacterial species, the gene probes of group (c) are selected from SEQ ID NO:785-918, 2864-2875, 2888 and 2907-2908, preferably from SEQ ID NO:785-909, 2864-2875, 2888 and 2907-2908 (compare Tab. 1). Equally, in order to provide the required controls (negative, positive, hybridisation controls), the gene probes of group (d) are selected from SEQ ID NO:919-947, preferably from SEQ ID NO:919-925 and 944-947, more preferably from SEQ ID NO: 919 and 921 (compare Tab. 1).

Tab. 1: Preferred gene probes for species identification, virulence determination and resistance determination of microorganisms

a) probes for species identification

SEQ ID NO	Probe
1	cataSaur_1_1
2	cataSaur_1_2
3	clfA_1_1
4	clfB_1_1
5	coa_1_1
6	coa_1_2
7	I-clpC_1_1
8	I-clpP_1_1
9	I-ctaA_1_1
10	I-ctsR_1_1
11	I-dltA_1_1
12	I-dltB_1_1
13	I-dltC_1_1
14	I-dnaK_1_1
15	I-elkT_1_1
16	I-femD_1_1
17	I-glnA_1_1
18	I-glnR_1_1
19	I-grlA_1_1
20	I-grlB_1_1
21	I-groEL_1_1
22	I-groES_1_1
23	I-hemA_1_1
24	I-hemE_1_1
25	I-hemH_1_1
26	I-hemL_1_1
27	I-hemY_1_1
28	I-lepA_1_1

SEQ ID NO	Probe
29	I-lrgA_1_1
30	I-lrgB_1_1
31	I-lytM_1_1
32	I-menB_1_1
33	I-menD_1_1
34	I-menE_1_1
35	I-menF_1_1
36	I-mreB_1_1
37	I-mreR_1_1
38	I-mutL_1_1
39	I-mutS_1_1
40	I-NAG_1_1
41	I-pbg_1_1
42	I-pbpF_1_1
43	I-pdhB_1_1
44	I-pdhC_1_1
45	I-rsbU_1_1
46	I-rsbV_1_1
47	I-rsbW_1_1
48	I-sgp_1_1
49	I-sirR_1_1
50	I-sodA_1_1
51	I-sodB_1_1
52	I-sstA_1_1
53	I-sstB_1_1
54	I-sstC_1_1
55	I-sstD_1_1
56	I-trx_1_1
57	I-yhiN_1_1
58	epiP-bsaP_1_1
59	geh_1_1
60	gyrA_1_1
61	gyrB_1_1
62	hemB_1_1
63	hemC_1_1
64	hemD_1_1
65	hemN_1_1
66	hsdS_1_1
67	hsdS_2_1
68	lip_1_1
69	menC_1_1
70	murC_1_1
71	nuc_1_1
72	pdhD_1_1
73	rpoB_1_1
74	SAV0431_1_1
75	SAV0439_1_1
76	SAV0440_1_1
77	SAV0441_1_1
78	sigB_1_1
79	spa_1_2
80	sstC_1_1
81	tag_1_1

SEQ ID NO	Probe
82	tyrA_1_1
83	I-aroC_1_1
84	I-aroA_1_1
85	I-cna_1_1
86	I-ebpS_1_1
87	I-eno_1_1
88	I-fbpA_1_1
89	I-fib_1_1
90	I-fnbB_1_1
91	I-srtA_1_1
92	I-stpC_1_1
93	I-fnbA_1_1
94	I-spa_1_1
95	I-aroE_1_1
96	I-aroF_1_1
97	I-aroG_1_1
98	I-asp23_1_1
99	I-atl_1_1
142	b1169_1_1
143	envZ_1_1
144	fliCb_1_1
145	nfrB_1_1
146	nlpA_1_1
147	pilAe_1_1
148	yacH_1_1
149	yagX_1_1
150	ycdS_1_1
151	yciQ_1_1
152	ymcA_1_1
174	ardeSE0106_1_1
175	ardeSE0107_1_1
176	aroiSE0105_1_1
177	atlE_1_1
178	agrB_1_1
179	agrC_1_1
180	alphSE1368_1_1
181	gad_1_1
182	glucSE1191_1_1
183	hsp10_1_1
184	icaA_1_1
185	icaB_1_1
186	mvaSSepid_1_1
187	nitreSE1972_1_1
188	nitreSE1974_1_1
189	nitreSE1975_1_1
190	oiamtSE1209_1_1
191	ORF1Sepid_1_1
192	ORF3bSepid_1_1
193	qacR_1_1
194	sin_1_1
195	ureSE1861_1_1
196	ureSE1863_1_1
197	ureSE1864_1_1

SEQ ID NO	Probe
198	ureSE1865_1_1
199	ureSE1867_1_1
209	folQShaemolyt_1_1
210	mvaCShaemolyticus_1_1
211	mvaDShaemolyt_1_1
212	mvaK1Shaemolyticus_1_1
213	mvaSShaemolyticus_1_1
214	RNApolsigm_1_1
216	agrB2Stalugd_1_1
217	agrC2Stalugd_1_1
218	agrCStalugd_1_1
219	slamStalugd_1_1
222	RNApolsigmSsapro_1_1
223	RNApolsigmSsapro_1_2
224	msrw1Stwar_1_1
225	nukMStwar_1_1
226	proDStwar_1_1
227	proMStwar_1_1
228	sigrpoStwar_1_1
229	tnpStwar_1_1
231	ARG56_1_1
232	ASL43f_1_1
233	BGL2_1_1
234	CACHS3_1_1
235	CCT8_1_1
236	CDC37_1_1
237	CEF3_1_1
238	CHS1_1_1
239	CHS2_1_1
240	CHS4_1_1
241	CHS5_1_1
242	CHT1_1_1
243	CHT2_1_1
244	CHT4_1_1
245	CSA1_1_1
246	5triphosphatase_1_1
247	AAF1_1_1
248	ADH1_1_1
249	ALS1_1_1
250	ALS7_1_1
251	EDT1_1_1
252	ELF_1_1
253	ESS1_1_1
254	FAL1_1_1
255	GAP1_1_1
256	GNA1_1_1
257	GSC1_1_1
258	GSL1_1_1
259	HIS1_1_1
260	HTS1_1_1
261	HWP1_2_1
262	HYR1_1_1
263	INT1a_1_1

SEQ ID NO	Probe
264	KRE15f_1_1
265	KRE6_1_1
266	KRE9_1_1
267	MIG1_1_1
268	MLS1_1_1
269	MP65_1_1
270	NDE1_1_1
271	PFK2_1_1
272	PHR1_1_1
273	PHR2_1_1
274	PHR3_1_1
275	PRA1_1_1
276	PRS1_1_1
277	RBT1_1_1
278	RBT4_1_1
279	RHO1_1_1
280	RNR1_1_1
281	RPB7_1_1
282	RPL13_1_1
283	RVS167_1_1
284	SHA3_1_1
285	SKN1_1_1
286	SRB1_1_1
287	TCA1_1_1
288	TRP1_1_1
289	YAE1_1_1
290	YRB1_1_1
291	YST1exon2_1_1
308	arcA_1_1
309	arcC_1_1
310	bkdA_1_1
311	cad_1_1
312	camE1_1_1
313	csrA_1_1
314	dacA_1_1
315	dfr_1_1
316	dhoD1a_1_1
317	ABC-eltA_1_1
318	agrBfs_1_1
319	agrCfs_1_1
320	dnaE_1_1
321	ebsA_1_1
322	ebsB_1_1
323	eep_1_1
324	efaR_1_1
325	gls24_glsB_1_1
326	gph_1_1
327	gyrAEf_1_1
328	metEf_1_1
329	mntHCb2_1_1
330	mob2_1_1
331	mvaD_1_1
332	mvaE_1_1

SEQ ID NO	Probe
333	parC_1_1
334	pcfG_1_1
335	phoZ_1_1
336	polC_1_1
337	ptb_1_1
338	recS1_1_1
339	rpoN_1_1
340	tms_1_1
341	tyrDC_1_1
342	tyrS_1_1
377	bglB_1_1
378	bglR_1_1
379	bglS_1_1
380	efmA_1_1
381	efmB_1_1
382	efmC_1_1
383	mreC_1_1
384	mreD_1_1
385	mvaDEfaecium_1_1
386	mvaEEfaecium_1_1
387	mvaK1Efaecium_1_1
388	mvaK2Efaecium_1_1
389	mvaSEfaecium_1_1
390	orf3_4Efaeciumb_1_1
391	orf6_7Efaecium_1_1
392	orf7_8Efaecium_1_1
393	orf9_10Efaecium_1_1
399	atsA_1_1
400	atsB_1_1
401	budC_1_1
402	citA_1_1
403	citW_1_1
404	citX_1_1
405	dalD_1_1
406	dalK_1_1
407	dalT_1_1
408	acoA_1_1
409	acoB_1_1
410	acoC_1_1
411	ahlK_1_1
412	fimK_1_1
413	glfKPN2_1_1
414	ltrA_1_1
415	mdcC_1_1
416	mdcF_1_1
417	mdcH_1_1
418	mrkA_1_1
419	mtrK_1_1
420	nifF_1_1
421	nifK_1_1
422	nifN_1_1
423	tyrP_1_1
424	ureA_1_1

SEQ ID NO	Probe
425	wbbO_1_1
426	wza_1_1
427	wzb_1_1
428	wzmKPN2_1_1
429	wztKPN2_1_1
430	yojH_1_1
431	liac_1_1
449	cymA_1_1
450	cymD_1_1
451	cymE_1_1
452	cymH_1_1
453	cymI_1_1
454	cymJ_1_1
455	ddrA_1_1
456	fdt-1_1_1
457	fdt-2_1_1
458	fdt-3_1_1
459	gatY_1_1
460	hydH_1_1
461	masA_1_1
462	nasA_1_1
463	nasE_1_1
464	nasF_1_1
465	pehX_1_1
466	pelX_1_1
467	tagH_1_1
468	tagK_1_1
469	tagT_1_1
470	glpR_1_1
471	lasRb_1_1
472	OrfX_1_1
473	pa0260_1_1
474	pa0572_1_1
475	pa0625_1_1
476	pa0636_1_1
477	pa1046_1_1
478	pa1069_1_1
479	pa1846_1_1
480	pa3866_1_1
481	pa4082_1_1
482	pilAp_1_1
483	PilAp2_1_1
484	pilC_1_1
485	PstP_1_1
486	purK_1_1
487	uvrDII_1_1
488	vsmI_1_1
489	vsmR_1_2
490	xcpX_1_1
523	cap1EStrpneu_1_1
524	cap1FStrpneu_1_1
525	cap1GStrpneu_1_1
526	cap3AStrpneu_1_1

SEQ ID NO	Probe
527	cap3BStrpneu_1_1
528	celAStrpneu_1_1
529	celBStrpneu_1_1
530	cglAStrpneu_1_1
531	cglBStrpneu_1_1
532	cglCStrpneu_1_1
533	cglDStrpneu_1_1
534	cinA_1_1
535	cps14EStrpneum_1_1
536	cps14FStrpneum_1_1
537	cps14GStrpneum_1_1
538	cps14HStrpneum_1_1
539	cps19aHStrpneum_1_1
540	cps19aIStrpneum_1_1
541	cps19aKStrpneum_1_1
542	cps19fGStrpneum_1_1
543	cps23fGStrpneum_1_1
544	dexB_1_1
545	dinF_1_1
546	1760Strpneu_1_1
547	acyPStrpneu_1_1
548	endAStrpneu_1_1
549	exoAStrpneu_1_1
550	exp72_1_1
551	fnlAStrpneu_1_1
552	fnlBStrpneu_1_1
553	fnlCStrpneu_1_1
554	gct18Strpneum_1_1
555	hexB1_1_1
556	hftsHstrpneu_1_1
557	immunofrag1Strpneu_1_1
558	immunofrag2Strpneu_2_1
559	immunofrag3Strpneu_2_1
560	kdtBStrpneu_1_1
561	lysAStrpneu_1_1
562	pcpBStrpneu_1_1
563	pflCStrpneu_1_1
564	plpA_1_1
565	prtA1Strpneu_1_1
566	pspC1Strpneu_1_1
567	pspC2_1_1
568	purRStrpneu_1_1
569	pyrDAStrpneum_1_1
570	SP0828Strpneu_1_1
571	SP0830Strpneu_1_1
572	SP0833Strpneu_1_1
573	SP0837_38Strpneu_1_1
574	SP0839Strpneu_1_1
575	ugdStrpneu_1_1
576	uncC_1_1
577	vicXStrepneu_1_1
578	wchA6bStrpneum_1_1
579	wci4Strpneum_1_1

SEQ ID NO	Probe
580	wciK4Strpneum_1_1
581	wciL4Strpneum_1_1
582	wciN6bStrpneum_1_1
583	wciO6bStrpneum_1_1
584	wciP6bStrpneum_1_1
585	wciY18Strpneum_1_1
586	wzdbStrpneum_1_1
587	wze6bStrpneum_1_1
588	wzy18Strpneum_1_1
589	wzy4Strpneum_1_1
590	wzy6bStrpneum_1_1
591	xpt_1_1
606	cpsA1Strgal_1_1
607	cpsB1Strgal_1_1
608	cpsC1Strgal_1_1
609	cpsD1Strgal_1_1
610	cpsE1Strgal_1_1
611	cpsG1Strgal_1_1
612	cpsIStragal_1_1
613	cpsJStragal_1_1
614	cpsKStragal_1_1
615	cpsMStragal_1_1
616	cpsYStragal_1_1
617	cpsYStragal_2_1
618	cylBStraga_1_1
619	cylEStraga_1_1
620	cylFStraga_1_1
621	cylHStraga_1_1
622	cylIStraga_1_1
623	cylJStraga_1_1
624	cylKStraga_1_1
625	0487Straga_1_1
626	0488Straga_1_1
627	0493Straga_1_1
628	0495Straga_1_1
629	0498Straga_1_1
630	0500Straga_1_1
631	0502Straga_1_1
632	0504Straga_1_1
633	folDStraga_1_1
634	neuA1Strgal_1_1
635	neuB1Strgal_1_1
636	neuC1Strgal_1_1
637	neuD1Strgal_1_1
638	recNStraga_1_1
639	ileSStraga_1_1
645	cyclStrpyog_1_1
646	fah_rph_hlo_Strpyog_1_1
647	int_1_1
648	int315.5_1_1
649	murEStrpyog_1_1
650	oppA_1_1
651	oppCStrpyog_1_1

SEQ ID NO	Probe
652	oppD_1_1
653	SPy0382Strpyog_1_1
654	SPy0390Strpyog_1_1
655	SpyM3_1351_1_1
656	vicXStrpyog_1_1
687	573Stprmut_1_1
688	580SStprmut_1_1
689	581_582SStprmut_1_1
690	584SStprmut_1_1
691	dltAStrmut_1_1
692	dltBStrmut_1_1
693	dltCppx1Strmut_1_1
694	dltDStrmut_1_1
695	lichStrbov_1_1
696	lytRStprmut_1_1
697	lytSStprmut_1_1
698	pepQStrrmut_1_1
699	pflCStrmut_1_1
700	recNStprmut_1_1
701	ytqBStrmut_1_1
706	atfA_1_1
707	atfB_1_1
708	atfC_1_1
709	ccmPrmi1_1_1
710	cyaPrmi_1_1
711	aad_1_1
712	flfB_1_1
713	flfD_1_1
714	flfN_1_1
715	flhD_1_1
716	floA_1_1
717	ftsK_1_1
718	gstB_1_1
719	hemCPrmi_1_1
720	hemDPrmi_1_1
721	hev_1_1
722	katA_1_1
723	lpp1_1_1
724	menE_1_1
725	mfd_1_1
726	nrpA_1_1
727	nrpB_1_1
728	nrpG_1_1
729	nrpS_1_1
730	nrpT_1_1
731	nrpU_1_1
732	pat_1_1
733	pmfA_1_1
734	pmfC_1_1
735	pmfE_1_1
736	ppaA_1_1
737	rsbA_1_1
738	rsbC_1_1

SEQ ID NO	Probe
739	speB_1_1
740	stmA_1_1
741	stmB_1_1
742	terA_1_1
743	terD_1_1
744	umoA_1_1
745	umoB_1_1
746	umoC_1_1
747	ureR_1_1
748	xerC_1_1
749	ygbA_1_1
776	envZPrvu_1_1
777	frdC_1_1
778	frdD_1_1
779	infBPrvu_1_1
780	lad_1_1
781	tna2_1_1
2843	carO_1_1
2844	gacS_1_1
2845	dhbA_1_1
2846	dhbB_1_1
2847	sid_1_1
2848	csuD_1_1
2849	csuC_1_1
2850	tnp-ACIBA_1_1
2851	waaA-ACIBA_1_1
2852	csuB_1_1
2853	csuA_B_1_1
2854	csuA_1_1
2855	put1_1_1
2856	por_1_1
2857	abc_1_1
2858	furACIBA_1_1
2859	dec_1_1
2860	cysI_1_1
2861	trpE_1_1
2862	put3_1_1
2863	ompA-ACIBA_1_1
2902	coa_3_1
2903	coa_2_2
2876	asr_1_1
2877	lacZ_1_1
2878	ehuS_1_1
2879	ehuV_1_1
2880	slyA_1_1
2881	ORF165_1_1
2882	ehuU_1_1
2883	ehuT_1_1
2884	ORF295_1_1
2885	ehuA_1_1
2886	ORF400_1_1
2887	H+ATPase_1_1
2889	smeE_1_1

SEQ ID NO	Probe
2890	eE_1_1
2891	StmPr1_1_1
2892	eD_2_1
2893	ppi_1_1
2894	pmp-STEMA_1_1
2895	pam_1_1
2896	ORF4-STEMA_1_1
2897	ORF2-STEMA_1_1
2898	et_1_1
2899	eF_1_1
2900	StmPr2_1_1
2901	smeF4494_1_1
2904	fasCAXStrdysg_1_1
2906	ydhK_1_1

b) virulence probes

SEQ ID NO	Probe
100	bsaE_1_1
101	bsaG_1_1
102	cap5h_1_1
103	cap5i_1_1
104	cap5j_1_1
105	cap5k_1_1
106	cap8H_1_1
107	cap8I_1_1
108	cap8J_1_1
109	cap8K_1_1
110	I-hld_1_1
111	I-hysA_1_1
112	I-IgGbg_1_1
113	EDIN_1_1
114	eta_1_1
115	etb_1_1
116	hglA_1_1
117	hglA_2_1
118	hglB_1_1
119	hglC_2_1
120	hla_1_1
121	hlb_1_2
122	lukF_1_1
123	lukS_1_1
124	lukS_2_1
125	NAG_1_1
126	sak_1_1
127	sea_1_1
128	seb_1_1
129	sec1_1_1
130	seg_1_1
131	seh_1_1
132	sel_1_1
133	set15_1_1

SEQ ID NO	Probe
134	set6_1_1
135	set7_1_1
136	set8_1_1
137	sprV8_1_1
138	tst_1_1
139	I-sdrC_1_1
140	I-sdrD_1_1
141	I-sdrE_1_1
153	b1202_1_1
154	eae_1_1
155	eltB_1_1
156	escR_1_1
157	escT_1_1
158	escU_1_1
159	espB_1_1
160	fes_1_1
161	fes_2_1
162	fteA_1_1
163	hlyA_1_1
164	hlyB_1_1
165	iucA_1_1
166	iucB_1_1
167	iucC_1_1
168	papG_1_1
169	rfbE_1_1
170	shuA_1_1
171	SLTII_1_1
172	toxA-LTPA_1_1
173	VT2vaB_1_1
200	gcaD_1_1
201	hld_orf5_1_1
202	icaC_1_1
203	icaD_1_1
204	icaR_1_1
205	psm_beta1and2_1_1
206	purR_1_1
207	spoVG_1_1
208	yabJ_1_1
215	lipShaemolyt_1_1
220	fblStalugd_1_1
221	slushABCStalugd_1_1
230	gehAStwar_1_1
292	CCN1_1_1
293	CDC28_1_1
294	CLN2_1_1
295	CPH1_1_1
296	CYB1_1_1
297	EFG1_1_1
298	MNT1_1_1
299	RBF1_1_1
300	RBF1_2_1
301	RIM101_1_1
302	RIM8_1_1

SEQ ID NO	Probe
303	SEC14_1_1
304	SEC4_1_1
305	TUP1_1_1
306	YPT1_1_1
307	ZNF1CZF1_2_1
343	asa1_1_1
344	asp1_1_1
345	cgh_1_1
346	cylA_1_1
347	cylB_1_1
348	cylI_1_1
349	cylL_cylS_1_1
350	cylM_1_1
351	ace_1_1
352	ef00108_1_1
353	ef00109_1_1
354	ef0011_1_1
355	ef00113_1_1
356	ef0012_1_1
357	ef0022_1_1
358	ef0031_1_1
359	ef0032_1_1
360	ef0040_1_1
361	ef0058_1_1
362	enlA_1_1
363	esa_1_1
364	esp_1_1
365	gelE_1_1
366	groEL_1_1
367	groES_1_1
368	rt1_1_1
369	sala_1_1
370	salb_1_1
371	sea1_1_1
372	sep1_1_1
373	vicK_1_1
374	yycH_1_1
375	yycI_1_1
376	yycJ_1_1
394	entA_entI_1_1
395	entD_1_1
396	entR_1_1
397	oep_1_1
398	sagA_1_2
432	cim_1_1
433	aldA_1_1
434	aldA_2_1
435	hemly_1_1
436	pSL017_1_1
437	pSL020_1_1
438	rcsA_1_1
439	rmlC_1_1
440	rmlD_1_1

SEQ ID NO	Probe
441	waaG_1_1
442	wbbD_1_1
443	wbbM_1_1
444	wbbN_1_1
445	wbdA_1_1
446	wbdC_1_1
447	wztKpn_1_1
448	yibD_1_1
491	aprA_1_1
492	aprE_1_1
493	ctx_1_2
494	algB_1_1
495	algN_1_1
496	algR_1_1
497	ExoS_1_1
498	fpvA_1_1
499	lasRa_1_1
500	lipA_1_1
501	lipH_1_1
502	Orf159_1_2
503	Orf252_1_1
504	pchG_1_1
505	PhzA_1_1
506	PhzB_1_1
507	PLC_1_1
508	plcN_1_1
509	plcR_1_1
510	pvdD_1_1
511	pvdF_1_2
512	pyocinS1_1_1
513	pyocinS1im_1_1
514	pyocinS2_1_1
515	pys2_1_1
516	pys2_2_1
517	rbf303_1_1
518	rhlA_1_1
519	rhlB_1_1
520	rhlR_1_1
521	TnAP41_1_2
522	toxA_1_1
592	igaStrpneu_1_1
593	lytA_1_1
594	nanA_1_1
595	nanBStrpneu_1_1
596	pcpCStrpneu_1_1
597	ply_1_1
598	prtAStrpneu_1_1
599	pspA_1_2
600	SP0834Strpneu_1_1
601	SP0834Strpneu_1_2
602	sphtraStrpneu_1_1
603	wciJStrpneu_1_1
604	wziyStrpneu_1_1

SEQ ID NO	Probe
605	wzxStrpneu_1_1
640	CAMPfactor_1_1
641	CAMPfactor_2_1
642	0499Straga_1_1
643	hylStragal_1_1
644	lipStragal_1_1
657	DNaseIStrpyog_1_1
658	fba2Strpyog_1_1
659	fhuAStrpyog_1_1
660	fhuB1Strpyog_1_1
661	fhuDStrpyog_1_1
662	fhuGStrpyog_1_1
663	hylA_1_1
664	hylP_1_1
665	hylp2_1_1
666	oppB_1_1
667	ropB_1_1
668	scpAStrpyog_1_1
669	sloStrpyog_1_1
670	smez-4Strpyog_1_1
671	sof_1_1
672	sof_2_1
673	speA_1_1
674	speB2Strpyog_1_1
675	speCStrpyog_1_1
676	speJStrpyog_1_1
677	srtBStrpyog_1_1
678	srtCStrpyog_1_1
679	srtEStrpyog_1_1
680	srtFStrpyog_1_1
681	srtGStrpyog_1_1
682	srtIStrpyog_1_1
683	srtKStrpyog_1_1
684	srtRStrpyog_1_1
685	srtTStrpyog_1_1
686	vicKStrpyog_1_1
702	hlyXStrmut_1_1
703	igaStrmitis_1_1
704	igaStrsanguis_1_1
705	perMStrmut_1_1
750	flaA_1_1
751	flaD_1_1
752	fliA_1_1
753	hpmA_1_1
754	hpmB_1_1
755	lpsPrmi_1_1
756	mrpA_1_1
757	mrpB_1_1
758	mrpC_1_1
759	mrpD_1_1
760	mrpE_1_1
761	mrpF_1_1
762	mrpG_1_1

SEQ ID NO	Probe
763	mrpH_1_1
764	mrpI_1_1
765	mrpJ_1_1
766	patA_1_1
767	putA_1_1
768	uca_1_1
769	ureDPrmi_1_1
770	ureEPrmi_1_1
771	ureFPrmi_1_1
772	zapA_1_1
773	zapB_1_1
774	zapD_1_1
775	zapE_1_1
782	end_1_1
783	pqrA_1_1
784	urg_1_1
2905	sloStrep_1_1

c) resistance probes

SEQ ID NO	Probe
785	blaIMP-7_1_1
786	mecISepid_1_1
787	blaOXA-10_1_2
788	blaB_1_1
789	ampC_1_1
790	I-blaR_1_1
791	blaOXA-32_1_1
792	bla-CTX-M-22_1_1
793	pbp2aStrpneu_1_1
794	blaSHV-1_1_1
795	blaOXA-2_1_1
796	blaRShaemolyt_1_1
797	blaIMP-7_1_2
798	I-mecR_1_1
799	blaOXY_1_1
800	dacCStrpyog_1_1
801	femA_1_1
802	mecA_1_1
803	blaIShaemolyt_1_1
804	blavim_1_1
805	pbp2b_1_1
806	pbp2primeSepid_1_1
807	pbp2x_1_1
808	pbp3Saureuc_1_1
809	pbp4_1_1
810	pbp5Efaecium_1_1
811	pbpC_1_1
812	I-mecI_1_1
813	pbp1a_1_1
814	I-blaI_1_1
815	blaTEM-106_1_1

SEQ ID NO	Probe
816	blaOXY-KLOX_1_1
817	ftsWEF_1_1
818	fmhB_1_1
819	cumA_1_1
820	femBShaemolyt_1_1
821	blaPER-1_1_1
822	bla_FOX-3_1_1
823	blaA_1_1
824	psrb_1_1
825	fmhA_1_1
826	mecR1Sepid_1_1
827	blaZ_1_1
828	blaOXA-1_1_1
829	fox-6_1_1
830	blaPrmi_1_1
831	aacA_aphDStwar_1_1
832	aacC1_1_2
833	aacC2_1_1
834	strB_1_1
835	aadA_1_1
836	aadB_1_2
837	aadD_1_1
838	aacA4_1_2
839	strA_1_1
840	aph-A3_1_1
841	aacC1_1_1
842	aacA4_1_1
843	aacA-aphD_1_1
844	I-spc_1_1
845	aphA3_1_1
846	ermC_1_1
847	linB_1_1
848	satSA_1_1
849	mdrSA_1_1
850	I-linA_1_1
851	ermB_1_2
852	ermA_1_1
853	satA_1_1
854	msrA_1_1
855	mphBM_1_1
856	mefA_1_1
857	mrx_1_1
858	dfrStrpneu_1_1
859	dfrA_1_1
860	cmlA5_1_1
861	catEfaecium_1_1
862	cat_1_1
863	tetAJ_1_1
864	tetL_1_1
865	tetM_1_1
866	vanH(tn)_1_1
867	vanA_1_1
868	vanHB2_1_1

SEQ ID NO	Probe
869	vanR_1_1
870	vanRB2_1_1
871	vanS(tn)_1_1
872	vanSB2_1_1
873	vanWB2_1_1
874	ddl_1_1
875	ble_1_1
876	vanXB2_1_1
877	vanY(tn)_1_1
878	vanYB2_1_1
879	vanB_1_1
880	vanZ(tn)_1_1
881	vanC-2_1_1
882	vanX(tn)_1_1
883	acrB_1_1
884	mexB_1_2
885	I-qacA_1_1
886	sulI_1_1
887	sul_1_1
888	cadBStalugd_1_1
889	mexA_1_1
890	acrR_1_1
891	emeA_1_1
892	acrA_1_1
893	rtn_1_1
894	abcXStrpmut_1_1
895	qacEdelta1_1_1
896	elkT-abcA_1_1
897	I-cadA_1_1
898	albA_1_1
899	wzm_1_1
900	msrCb_1_1
901	nov_1_1
902	wzt_1_1
903	wbbl_1_1
904	norA23_1_1
905	mexR_1_1
906	arr2_1_1
907	mreA_1_1
908	I-cadC_1_1
909	uvrA_1_1
910	CRD2_1_1
911	CDR1_1_1
912	CDR1_2_1
913	MET3_1_1
914	FET3_1_1
915	FTR2_1_1
916	MDR1-7_1_1
917	ERG11_1_1
918	SEC20_1_1
2864	aacA4ENCL_1_1
2865	AdeR-ACIBA_1_1
2866	adeA-ACIBA_1_1

SEQ ID NO	Probe
2867	aac(6p)-lb7_1_1
2868	adeB-ACIBA_1_1
2869	adeC-ACIBA_1_1
2870	AdeS-ACIBA_1_1
2871	blaL2_1_1
2872	blaMIR-3_1_1
2873	ampR_1_1
2874	ampC-ENCL_1_1
2875	blaL1_1_1
2888	sulII_1_1
2907	tetA-ACIBA_1_1
2908	tetR-ACIBA_1_1

d) controls and utility

SEQ ID NO	Probe
919	rbcL_1_1
925	rbcL_1_2
920	LDHA(hu)_1_1
921	GAPD(hu)_1_1
922	b-Act(hu)_1_1
923	ARHGDIA(hu)_1_1
924	PGK1(hu)_1_1
926	16SPa_1_1
927	23SEfaecium_2_1
928	16SStrepyog_1_1
929	16SStrepneu_1_1
930	16SStrepagalactiae_1_1
931	16SEfaecium_1_1
932	16SEfaecium_2_1
933	16SRNAEf_2_1
934	16SKpn_1_1
935	16SSa_3_1
936	16SRNAEf_1_1
937	16SShominis_1_1
938	16SShaemolyt_1_1
939	23SEfaecium_1_1
940	16SrRNAPrmi_1_1
941	16SrRNAPrvu1_1_1
942	16SSa_1_1
943	16SKlox_1_1
944	p53_1_1
945	0135mihck_1_1
946	FAN_1_1
947	0270cap_1_1
2842	16SStrepdysgal_1_1

The DNA microarray of (1) is preferably suitable for (I) identification of *Staphylococcus aureus* and comprises one or more or all gene probes selected from SEQ ID NO:3-6, 31, 40, 50, 51, 58, 59, 63, 64, 66-69, 71, 74, 76, 77, 79, 2902 and 2903, preferably at least one of the gene probes represented by SEQ ID NO:71, 68, 4 and 69; and/or

(II) identification of *Escherichia coli* and comprises one or more or all gene probes selected from SEQ ID NO:142, 144, 145, 148, 150-152, 160, 161 and 170, preferably at least one of the gene probes represented by SEQ ID NO:145, 160, 161 and 170; and/or

(III) identification of *Staphylococcus epidermidis* and comprises gene probes selected from SEQ ID NO:174, 175, 177, 178, 180-182, 185-193, 198 and 199, preferably at least one of the gene probes represented by SEQ ID NO:177, 178 and 190; and/or

(IV) identification of *Staphylococcus haemolyticus* and comprises one or more or all gene probes selected from SEQ ID NO:211, 213 and 214, preferably at least one of the gene probes represented by SEQ ID NO:211 and 214; and/or

(V) identification of *Staphylococcus lugdunensis* and comprises one or more or all gene probes selected from SEQ ID NO:216, 217 and 219-221, preferably at least one of the gene probes represented by SEQ ID NO:216, 219, 220 and 221; and/or

(VI) identification of *Staphylococcus warneri* and comprises one or more or all gene probes selected from SEQ ID NO:224-228 and 230 preferably at least one of the gene probes represented by SEQ ID NO:224, 226 and 230; and/or

(VII) identification of *Staphylococcus saprophyticus* and comprises one or more or all gene probes selected from SEQ ID NO:222 and 223; and/or

(VIII) identification of *Staphylococcus hominis* and comprises one or more or all gene probes selected from SEQ ID NO:2096, 194 and 229 (do hybridise with S. hominis DNA) and 211 and 214 (do not hybridise with S. hominis DNA); and/or

(IX) identification of *Candida albicans* and comprises one or more or all gene probes selected from SEQ ID NO:231-291, preferably at least one of the gene probes represented by SEQ ID NO:232 and 249; and/or

(X) identification of *Enterococcus faecalis* and comprises one or more or all gene probes selected from SEQ ID NO:308-310 and 312-342, preferably at least one of the gene probes represented by SEQ ID NO:308, 310 and 314; and/or

(XI) identification of *Enterococcus faecium* and comprises one or more or all gene probes selected from SEQ ID NO:377-393, preferably at least one of the gene probes represented by SEQ ID NO:380 and 385; and/or

(XII) identification of *Klebsiella pneumoniae* and comprises one or more or all gene probes selected from SEQ ID NO:399, 401-404, 408-415, 417, 420-423, 425 and 427-431, preferably at least one of the gene probes represented by SEQ ID NO:401, 410 and 430; and/or

(XIII) identification of *Klebsiella oxytoca* and comprises one or more or all gene probes selected from SEQ ID NO:459 and 466-469, preferably at least one of the gene probes represented by SEQ ID NO:459, 468 and 469; and/or

(XIV) identification of *Pseudomonas aeruginosa* and comprises one or more or all gene probes selected from SEQ ID NO:470-485, 487-493 and 505, preferably at least one of the gene probes represented by SEQ ID NO:471, 474, 488 and 505; and/or

(XV) identification of *Streptococcus pneumoniae* and comprises one or more or all gene probes selected from SEQ ID NO:523-591, preferably at least one of the gene probes represented by SEQ ID NO:558 and 562; and/or

(XVI) identification of *Streptococcus agalactiae* and comprises one or more or all gene probes selected from SEQ ID NO:606-639, preferably at least one of the gene probes represented by SEQ ID NO: 606 and 619; and/or

(XVII) identification of *Streptococcus pyogenes* and comprises one or more or all gene probes selected from SEQ ID NO:645-648, 652, 655, 656, 658 and 660, preferably at least one of the gene probes represented by SEQ ID NO:645, 658 and 660; and/or

(XVIII) identification of *Streptococcus mutans* and comprises one or more or all gene probes selected from SEQ ID NO:687-701, preferably at least one of the gene probes represented by SEQ ID NO:687, 691 and 692; and/or

(XIX) identification of *Proteus mirabilis* and comprises one or more or all gene probes selected from SEQ ID NO:706-710, 712-742 and 744-749, preferably at least one of the gene probes represented by SEQ ID NO:721, 725 and 735; and/or

(XX) identification of *Proteus vulgaris* and comprises one or more or all gene probes selected from SEQ ID NO:776-778 and 780-781, preferably at least one of the gene probes represented by SEQ ID NO:776, 777 and 781; and/or

(XXI) identification of *Acinetobacter baumanii* and comprises one or more or all gene probes selected from SEQ ID NO:2843-2863, preferably at least one of the gene probes represented by SEQ ID NO:2858 and 2863.

In a preferred aspect of present invention, the DNA microarray of embodiment (1) is suitable for species specific identification of at least *S. aureus* and preferably comprises gene probes selected from SEQ ID NO:3-6, 31, 40, 50, 51, 58, 59, 63, 64, 66-69, 71, 74, 76, 77, 79, 2902 and 2903, more preferably from SEQ ID NO:4, 68, 69 and 71, even more preferably comprises at least SEQ ID NO:71.

In a second preferred aspect, the DNA microarray is suitable for species specific identification of at least *S. aureus, E. coli,* CoNS, Enterococcus sp., and/or Candida sp., and preferably comprises gene probes selected from

a) SEQ ID NO:4, 68, 69 and 71, preferably SEQ ID NO: 71 for identification of *S. aureus*;

b) SEQ ID NO: 145, 160, 161 and 170, preferably SEQ ID NO:145 for identification of *E. coli*;

c) SEQ ID NO:177, 178 and 190, preferably SEQ ID NO:178 for identification of *S. epidermidis*;

d) SEQ ID NO:60, 61, 70, 72, 78 and 125, preferably SEQ ID NO:78 for identification of the genus Staphylococci including *S. aureus*;

e) SEQ ID NO:210, 224 and 2906, preferably 2906 for identification of CoNS;

f) SEQ ID NO:308, 310 and 314, preferably SEQ ID NO:310 for identification of *Enterococcus faecalis;*

g) SEQ ID NO:380 and 385, preferably SEQ ID NO:380 for identification of *Enterococcus faecium;*

h) SEQ ID NO:232 and 249, preferably SEQ ID NO:249 for identification of *Candida albicans;*

respectively. These microorganisms are the prevalent microorganisms in clinical samples and/or are of the highest diagnostic relevance. The probes listed under (a) to (h) are the most reliable probes for identification of said microorganisms.

From above second preferred aspect, there can be selected a set of probes which is even more preferred, namely SEQ ID NO:71, 2906, 145 and 249. A DNA microarray comprising one, several or all of said four probes is suitable for species specific detection or differentiation of

(i) *S. aureus* if it comprises SEQ ID NO:71;

(ii) CoNS if it comprises SEQ ID NO:2906;

(iii) E. coli if it comprises SEQ ID NO:145; and/or

(iv) *Candida albicans* if it comprises SEQ ID NO:249.

This set of four probes thus forms an especially preferred set of probes for embodiment (1).

There are some further sets of probes which are especially preferred for the DNA microarray of embodiment (1). Namely, there are a few DNA microarrays which form preferred aspects of embodiment (1). They are suitable for species-specific identification and differentiation of the following sets of microorganisms and therefore comprise at least the minimum number of probes which are necessary for the species specific identification:

(A) *S. aureus*;

(B) Staphylococci including *S. aureus* and CoNS;

(C) set (A) or (B) additionally including *E. coli*;

(D) any of the sets of (A) to (C) additionally including *C. albicans;*

(E) any of the sets of (A) to (D) additionally including Enterococcus sp.;

(F) any of the sets of (A) to (E) additionally including Proteus sp. and/or *P. aeruginosa*.

Sets (B), (C) and (D) are preferred, set (D) is especially preferred.

In addition, the DNA microarray of embodiment (1) may be suitable for additional species specific identification or differentiation of one or more of *Klebsiella pneumoniae, Klebsiella oxytoca, Streptococcus pneumoniae, Streptococcus pyogenes, Pseudomonas aeruginosa, Proteus mirabilis* and *Proteus vulgaris.*

In a further especially preferred aspect, the DNA microarray of (1) is suitable for
(I) virulence determination of *Staphylococcus aureus* and comprises one or more or all of the gene probes of group (b) selected from SEQ ID NO:100-141; and/or
(II) virulence determination of *Escherichia coli* and comprises one or more or all of the gene probes of group (b) selected from SEQ ID NO:153-173; and/or

(III) virulence determination of *Staphylococcus epidermidis* and comprises one or more or all of the gene probes of group (b) selected from SEQ ID NO:200-208; and/or

(IV) virulence determination of *Staphylococcus haemolyticus* and comprises the gene probe of group (b) represented by SEQ ID NO:215; and/or

(V) virulence determination of *Staphylococcus lugdunensis* and comprises one or more or all of the gene probes of group (b) selected from SEQ ID NO:220-221; and/or

(VI) virulence determination of *Staphylococcus warneri* and comprises the gene probe of group (b) represented by SEQ ID NO:230; and/or

(VII) virulence determination of *Candida albicans* and comprises one or more or all of the gene probes of group (b) selected from SEQ ID NO:292-307; and/or

(VIII) virulence determination of *Enterococcus faecalis* and comprises one or more or all of the gene probes of group (b) selected from SEQ ID NO:343-376; and/or

(IX) virulence determination of *Enterococcus faecium* and comprises one or more or all of the gene probes of group (b) selected from SEQ ID NO:394-398; and/or

(X) virulence determination of *Klebsiella pneumonia* and comprises one or more or all of the gene probes of group (b) selected from SEQ ID NO:432-448; and/or

(XI) virulence determination of *Klebsiella oxytoca*; and/or

(XII) virulence determination of *Pseudomonas aeruginosa* and comprises one or more or all of the gene probes of group (b) selected from SEQ ID NO:491-522; and/or

(XIII) virulence determination of *Streptococcus pneumoniae* and comprises one or more or all of the gene probes of group (b) selected from SEQ ID NO:592-605; and/or

(XIV) virulence determination of *Streptococcus agalactiae* and comprises one or more or all of the gene probes of group (b) selected from SEQ ID NO:640-644; and/or

(XV) virulence determination of *Streptococcus pyogenes* and comprises one or more or all of the gene probes of group (b) selected from SEQ ID NO:657-686; and/or

(XVI) virulence determination of *Streptococcus mutans* and comprises one or more or all of the gene probes of group (b) selected from SEQ ID NO:702-705; and/or

(XVII) virulence determination of *Proteus mirabilis* and comprises one or more or all of the gene probes of group (b) selected from SEQ ID NO:750-775; and/or (XVIII) virulence determination of *Proteus vulgaris* and comprises one or more or all of the gene probes of group (b) selected from SEQ ID NO:782-784.

In a further especially preferred aspect, the DNA microarray of (1) is suitable for antibiotic resistance determination of (I) *Staphylococcus aureus,* (II) *Escherichia coli,* (III) *Staphylococcus epidermidis,* (IV) *Staphylococcus haemolyticus,* (V) *Staphylococcus lugdunensis,* (VI) *Staphylococcus warneri,* (VIII) *Enterococcus faecalis,* (IX) *Enterococcus faecium,* (X) *Klebsiella pneumonia,* (XI) *Klebsiella oxytoca,* (XII) *Pseudomonas aeruginosa,* (XIII) *Streptococcus pneumoniae,* (XIV) *Streptococcus agalactiae,* (XV) *Streptococcus pyogenes,* (XVI) *Streptococcus viridans,* (XVII) *Proteus mirabilis,* and/or (XVIII) *Proteus vulgaris* and comprises one or more or all of the gene probes of group (c) selected from SEQ ID NO:785-909; 2864-2875, 2888, 2907-2908 and/or
it is suitable for antibiotic resistance determination of (VII) *Candida albicans* and comprises one or more or all of the gene probes of group (c) selected from SEQ ID NO:910-918.

In a preferred embodiment, the microarray of (1) is suitable for identification and characterisation, i.e. virulence and/or resistance determination, of the target microorganism and comprises one or more or all of the gene probes of group (a) and additionally one or more or all of the gene probes of group (b) and group (c) for each organism as listed above.

If the identification and/or characterisation of *S. aureus*, *E. coli* and/or *P. aeruginosa* is the aim of a test using the array, then the array comprises preferably at least the core gene probes designated in example 1.7, more preferably all the sequences listed in Tab. 2 and/or Tab. 6. Even more preferred, it consists of said sequences.

The gene probes were considered as most preferable if they were i) known previously to be species-specific, ii) bioinformatically selected to have the least chance to hybridise with nontarget genes and iii) empirically proven to be specific in a series of experiments (see Examples).

In a most especially preferred aspect, the DNA microarray of (1) comprises the following gene probes, even more preferably consists of the following gene probes:

(I) When the DNA microarray is suitable for identification and characterisation of *Staphylococcus aureus,* it comprises

(a) the gene probes represented by SEQ ID NO:3-6, 31, 40, 50, 51, 58, 59, 63, 64, 66-69, 71, 74, 76, 77, 79, 2902 and 2903; and at least one of

(b) the gene probes represented by SEQ ID NO:100-141 and

(c) the gene probes represented by SEQ ID NO:785-909, 2864-2875, 2888, 2907, 2908.

(II) When the DNA microarray is suitable for identification and characterisation of *Escherichia coli*, it comprises

(a) the gene probes represented by SEQ ID NO:142, 144, 145, 148, 150-152, 160, 161 and 170; and at least one of

(b) the gene probes represented by SEQ ID NO:153-173 and

(c) the gene probes represented by SEQ ID NO: 785-909, 2864-2875, 2888, 2907, 2908.

(III) When the DNA microarray is suitable for identification and characterisation of *Staphylococcus epidermidis*, it comprises

(a) the gene probes represented by SEQ ID NO:174, 175, 177, 178, 180-182, 185-193, 198 and 199; and at least one of

(b) the gene probes represented by SEQ ID NO: 200-208 and

(c) the gene probes represented by SEQ ID NO: 785-909, 2864-2875, 2888, 2907, 2908.

(IV) When the DNA microarray is suitable for identification and characterisation of *Staphylococcus haemolyticus*, it comprises

(a) the gene probes represented by SEQ ID NO:211, 213 and 214; and at least one of

(b) the gene probes represented by SEQ ID NO: 215 and

(c) the gene probes represented by SEQ ID NO: 785-909, 2864-2875 2888, 2907, 2908.

(V) When the DNA microarray is suitable for identification and characterisation of *Staphylococcus lugdunensis*, it comprises

(a) the gene probes represented by SEQ ID NO:216, 217 and 219-221; and at least one of

(b) the gene probes represented by SEQ ID NO: 220-221 and

(c) the gene probes represented by SEQ ID NO: 785-909, 2864-2875 2888, 2907, 2908.

(VI) When the DNA microarray is suitable for identification and characterisation of *Staphylococcus warneri*, it comprises

(a) the gene probes represented by SEQ ID NO:224-228 and 230; and at least one of

(b) the gene probes represented by SEQ ID NO: 230 and

(c) the gene probes represented by SEQ ID NO: 785-909, 2864-2875 2888, 2907, 2908.

(VII) When the DNA microarray is suitable for identification and characterisation of *Staphylococcus saprophyiticus*, it comprises

(a) the gene probes represented by SEQ ID NO:222 and 223; and at least one of

(c) the gene probes represented by SEQ ID NO: 785-909, 2864-2875 2888, 2907, 2908.

(VIII) When the DNA microarray is suitable for identification and characterisation of *Staphylococcus hominis*, it comprises

(a) the gene probes represented by SEQ ID NO:2096, 194, 229, 211 and 214; and at least one of

(c) the gene probes represented by SEQ ID NO: 785-909, 2864-2875 2888, 2907, 2908.

(IX) When the DNA microarray is suitable for identification and characterisation of *Candida albicans*, it comprises

(a) the gene probes represented by SEQ ID NO:231-291; and at least one of

(b) the gene probes represented by SEQ ID NO: 292-307 and

(c) the gene probes represented by SEQ ID NO: 910-918, 2864-2875 2888, 2907, 2908.

(X) When the DNA microarray is suitable for identification and characterisation of *Enterococcus faecalis*, it comprises

(a) the gene probes represented by SEQ ID NO:308-310 and 312-342; and at least one of

(b) the gene probes represented by SEQ ID NO: 343-376 and

(c) the gene probes represented by SEQ ID NO: 785-909, 2864-2875 2888, 2907, 2908.

(XI) When the DNA microarray is suitable for identification and characterisation of *Enterococcus faecium*, it comprises

(a) the gene probes represented by SEQ ID NO:377-393; and at least one of

(b) the gene probes represented by SEQ ID NO: 394-398 and

(c) the gene probes represented by SEQ ID NO: 785-909, 2864-2875 2888, 2907, 2908.

(XII) When the DNA microarray is suitable for identification and characterisation of *Klebsiella pneumonia*, it comprises

(a) the gene probes represented by SEQ ID NO:399, 401-404, 408-415, 417, 420-423, 425 and 427-431; and at least one of

(b) the gene probes represented by SEQ ID NO: 432-448 and

(c) the gene probes represented by SEQ ID NO: 785-909, 2864-2875 2888, 2907, 2908.

(XIII) When the DNA microarray is suitable for identification and characterisation of *Klebsiella oxytoca,* it comprises

(a) the gene probes represented by SEQ ID NO:459 and 466-469; and at least one of

(c) the gene probes represented by SEQ ID NO: 785-909, 2864-2875 2888, 2907, 2908.

(XIV) When the DNA microarray is suitable for identification and characterisation of *Pseudomonas aeruginosa*, it comprises

(a) the gene probes represented by SEQ ID NO:470-485, 487-493 and 505; and at least one of

(b) the gene probes represented by SEQ ID NO: 491-522 and

(c) the gene probes represented by SEQ ID NO: 785-909, 2864-2875 2888, 2907, 2908.

(XV) When the DNA microarray is suitable for identification and characterisation of *Streptococcus pneumoniae*, it comprises

(a) the gene probes represented by SEQ ID NO:523-591; and at least one of

(b) the gene probes represented by SEQ ID NO: 592-605 and

(c) the gene probes represented by SEQ ID NO: 785-909, 2864-2875 2888, 2907, 2908.

(XVI) When the DNA microarray is suitable for identification and characterisation of *Streptococcus agalactiae*, it comprises

(a) the gene probes represented by SEQ ID NO:606-639; and at least one of

(b) the gene probes represented by SEQ ID NO: 640-644 and

(c) the gene probes represented by SEQ ID NO: 785-909, 2864-2875 2888, 2907, 2908.

(XVII) When the DNA microarray is suitable for identification and characterisation of *Streptococcus pyogenes*, it comprises

(a) the gene probes represented by SEQ ID NO:645-648, 652, 655-656, 658 and 660; and at least one of

(b) the gene probes represented by SEQ ID NO: 657-686 and

(c) the gene probes represented by SEQ ID NO: 785-909, 2864-2875 2888, 2907, 2908.

(XVIII) When the DNA microarray is suitable for identification and characterisation of *Streptococcus mutans*, it comprises

(a) the gene probes represented by SEQ ID NO:687-701; and at least one of

(b) the gene probes represented by SEQ ID NO: 702-705 and

(c) the gene probes represented by SEQ ID NO: 785-909, 2864-2875 2888, 2907, 2908.

(XIX) When the DNA microarray is suitable for identification and characterisation of *Proteus mirabilis*, it comprises

(a) the gene probes represented by SEQ ID NO:706-710, 712-742 and 744-749; and at least one of

(b) the gene probes represented by SEQ ID NO: 750-775 and

(c) the gene probes represented by SEQ ID NO: 785-909, 2864-2875 2888, 2907, 2908.

(XX) When the DNA microarray is suitable for identification and characterisation of *Proteus vulgaris*, it comprises

(a) the gene probes represented by SEQ ID NO:776-778 and 780-781; and at least one of

(b) the gene probes represented by SEQ ID NO: 782-784 and

(c) the gene probes represented by SEQ ID NO: 785-909, 2864-2875 2888, 2907, 2908.

(XXI) When the DNA microarray is suitable for identification and characterisation of *Acinetobacter baumanii*, it comprises

(a) the gene probes represented by SEQ ID NO:2843-2863; and at least one of

(c) the gene probes represented by SEQ ID NO: 785-909, 2864-2875 2888, 2907, 2908.

The DNA microarray which is a preferred aspect of embodiment (1) can be fabricated using textbook methods for microarray production, including printing with fine-pointed pins onto the solid support, photolithography using pre-made masks or dynamic micromirror devices, ink-jet printing or electrochemistry on microelectrode arrays (Müller, H.-J., Röder, T., "Der Experimentator: Microarrays, Spektrum Akademischer Verlag, Heidelberg (2004)). Preferred fabrication methods are printing methods spotting the gene probes onto the solid surface of the microarray. The attachment of the spotted DNA to the surface is achieved by covalent or non-covalent binding, preferably by non-covalent binding, more preferably by electrostatic interaction (ionic binding), most preferably by ionic binding of the DNA to amino groups present on the surface of the solid support. Any amino-functionalized microarray support can be used, but gamma aminopropyl silane (GAPS™) coated slides, especially UltraGAPS™ coated glass slides, are preferred in present invention.

The amount of DNA per spot printed onto the array is from 0.1 to 15.0 ng, preferably from 0.1 to 0.2 ng.

Thus, the present invention also pertains to a method for fabrication of a microarray of embodiment (1), which method comprises spotting the gene probes listed above to an appropriate solid support.

The sample of embodiments (1) to (4) may be any sample containing microorganisms, including food samples, environmental samples and clinical specimens. A sample which is a clinical specimen is preferred. The sample or clinical specimen of embodiments (1) to (4) is preferably selected from the group consisting of whole blood, serum, urine, saliva, liquor, sputum, punktate, stool, pus, swabs, wound fluid and positive blood cultures, more preferably is whole blood or a positive blood culture, most preferably is a positive blood culture. If blood culture is used as DNA source, 0.5 ml positive blood culture is sufficient for identification and characterisation of the microorganisms and bacteria present without prior amplification of the target DNA.

Thus, the microarray of present application is

(i) a robust diagnostic tool, detecting all tested bacterial reference strains and clinical isolates;

(ii) sensitive enough to yield positive signals with e.g. only 20 ng of purified genomic *S. aureus* DNA or 2 µg of DNA extracted from blood culture which contains a high percentage of human DNA;

(iii) highly specific, distinguishing e.g. *S. aureus* from distantly related gram-negative bacteria like *Escherichia coli* or *Pseudomonas aeruginosa* as well as from closely related CoNS;

(iv) precise enough to identify virulence factors and antibiotic resistance determinant genes without previous amplification by PCR.

Moreover, the whole procedure can be accomplished the same day after blood cultures become positive (e.g. in the Bactec®). Rapid identification of the causative pathogen in fungemia, bacteremia and sepsis is crucial for several reasons:

(i) appropriate antimicrobial therapy should be started as early as possible and unnecessary treatment avoided;

(ii) the prognosis of the patients with sepsis may be improved; and

(iii) expenditures on antimicrobials and prolonged hospitalisation can be reduced.

The DNA microarray of embodiment (1) is especially suitable for diagnosis of

(i) bacteremia, fungemia or sepsis, wherein the device preferably comprises probes for species specific identification of at least *S. aureus, E. coli,* CoNS, Enterococcus sp., and Candida sp.;

(ii) respiratory tract infections, wherein the device preferably comprises probes for species specific identification of at least Candida sp., *S. aureus* and *P. aeruginosa*; and/or

(iii) urinary tract infections, wherein the device preferably comprises probes for species specific identification of at least *E. coli*, Enterococci sp., Candida sp. and Proteus sp..

With the gene-segment based microarray of (1) there is an excellent correlation between genotypic detection of antibiotic resistance determinants and phenotypic typing using conventional susceptibility testing. In one aspect of the invention, the detection of the resistance genes *mecA*, *blaZ*, *ermA*, *ermC*, *msrSA*, *aadD* and *aacA-aphD* by microarray hybridisation allows for reliable prediction of oxacillin, penicillin, erythromycin, tobramycin and gentamicin resistance in a single assay.

By microarray hybridisation according to present invention it is furthermore possible to discriminate multi-resistant and multi-susceptible MRSA (strain MW2). Multi-susceptible MRSA have been shown to be susceptible to tobramycin and erythromycin (Polyzou, A. et al., J. Antimicrob. Chemother. 48:231-4 (2001); Pournaras, S. et al., J. Clin. Microbiol. 39:779-81 (2001)).

In a preferred aspect of the invention, simultaneous comprehensive resistance genotyping for oxacillin, macrolide and aminoglycoside resistance genes (preferably *mecA*, *aadD*, *aacA-aphD*, *ermA,B,C* and *msrSA*) by microarray hybridisation allows the rapid discrimination of multi-resistant or multi-susceptible strains and in consequence other therapeutic options with e.g. macrolides and may reduce reliance on vancomycin (Polyzou, A. et al., J. Antimicrob. Chemother. 48:231-4 (2001); Pournaras, S. et al., J. Clin. Microbiol. 39:779-81 (2001)).

One preferred aspect of embodiment (1) is a DNA microarray for the identification and characterisation of the three important bacteremia causing species *Staphylococcus aureus*, *Escherichia coli* and *Pseudomonas aeruginosa* in a sample, preferably in blood culture. The microarray allows simultaneous species identification and detection of important virulence and antibiotic resistance genes in a single assay. Preferably, this array consists of 2-20 species specific gene probes, 1-20 virulence gene probes and 1-20 resistance gene probes of at least 100 nt length, more preferably of 200-800 nt length. One especially preferred embodiment is an array comprising or consisting of the gene probes listed in Tab. 2. The probes may be amplified from recombinant plasmids or synthesized by any other method know in the art. These probes represent genes encoding house-keeping proteins, virulence factors and antibiotic resistance determinants. Evaluation with 42 clinical isolates, 3 reference strains and 13 positive blood cultures revealed that this DNA microarray is highly specific in identifying *S. aureus*, *E. coli* and *P. aeruginosa* strains and in discriminating them from closely related Gram-positive and Gram-negative bacterial strains also known to be etiological agents of bacteremia. In Example 1.6 and 1.7, this array was successful in identifying all tested 27 *E. coli*, *P. aeruginosa* and *S. aureus* strains and in discriminating them from 21 closely related Gram positive and Gram negative bacterial strains. There is a nearly perfect correlation between genotypic antibiotic resistance by hybridisation to the *S. aureus* resistance gene probes *mecA* (oxacillin/methicillin resistance), *aacA-aphD* (gentamicin resistance), *ermA* (erythromycin resistance) and *blaZ* (penicillin resistance) and the *E. coli* resistance gene probes *blaTEM-106* (penicillin resistance) and *aacC2* (aminoglycoside resistance) and phenotypic antibiotic resistance determined by conventional susceptibility testing (Example 1.10).

One further preferred aspect of embodiment (1) of the invention is a DNA microarray for the identification and characterisation of *S. aureus* in a sample, preferably in blood culture. Evaluation with 10 clinical isolates, 6 reference strains and 10 positive blood cultures revealed that this DNA microarray is highly specific in identifying *S. aureus* and in discriminating them from closely related Gram-positive and Gram-negative bacterial strains also known to be etiological agents of bacteremia (Example 1.11).

The DNA microarray is - in the context of embodiment (2) - preferably used for *in vitro* differentiation of a plurality of different microbial strains contained in one sample and/or for species-specific identification of one or more microbial strain(s) contained in a mixture of a plurality of microorganisms. The DNA microarray of embodiment (1) is advantageous for this kind of use, as it allows the simultaneous determination of the presence or absence in the analysed sample of all those microbial strains for which the device comprises species specific probes. The array is also suitable for identification and determination of single or of a selection of microbial strains in a mixture of strains, especially in a clinical sample containg additional component, without prior isolation of the target strain. These advantages (simultaneous determination and applicability to clinical samples and mixtures) make the DNA microarray of embodiment (1) superior to conventional techniques of DNA amplification for identification of microbial strains like PCR.

The method of embodiment (3) comprises - after isolating the total DNA (including non-microbial DNA) from a sample - the steps of immediate labelling and microarray-based detection of this isolated DNA with or without, preferably without, further DNA amplification steps after the DNA isolation. It is one advantage of the method (3) that it can be performed without said further DNA amplification steps, i.e. the isolated DNA is labelled and applied to the microarray without prior amplification. The use of a single protocol for all microbial species comprising all steps of a microarray procedure including DNA preparation and DNA-chip hybridisation, is essential for testing blood cultures or other clinical specimens, where the bacterial diagnosis is usually uncertain. Preferably, a DNA preparation protocol employing sonication for simultaneous cell disruption and target DNA fragmentation is the method of choice to increase the sensitivity of the microarray, in particular towards low-copy number and/or plasmid encoded genes which may be underrepresented in the target DNA.

The method of embodiment (3) is preferably a method for diagnosis of bacteremia, fungemia or sepsis. Furthermore, the sample or clinical specimen used in embodiment (3) is preferably blood or derived from blood, more preferably is a blood culture. Most preferably, the clinical specimen is a positive blood culture.

To obtain positive signals in the method of embodiment (3), 100 pg of purified genomic microbial DNA may be sufficient (lower detection limit), but preferably at least 1 ng of said DNA should be present in the sample. Usually, at least 10 ng, preferably at least 20 ng, more preferably at least 1 μg of purified genomic microbial DNA or at least 1 μg, preferably at least 2 μg of DNA extracted from blood culture are required. 500 μl of positive blood culture yield enough DNA for several hybridisations.

In a preferred aspect of the method of embodiment (3), the DNA isolated in step (a) is labelled and applied to the analytical device without prior amplification, preferably is labelled by random priming. In a further preferred aspect, the DNA isolated in step (a) is fragmented before the labelling reaction. Both aspects simplify and speed up the analysis in comparison to convention methods.

In the method of embodiment (3), the ratio of microbial DNA to total DNA isolated from said sample or clinical specimen is less than or equal to 100 %, preferably is from 1% to 99%, more preferably from 30 to 60%.

The labelling reaction of the method of embodiment (3) may be any DNA labelling reaction known in the art. However, chemical labelling reactions consisting of chemical attachment of a reporter molecule to the sample DNA and labelling by integration of labelled nucleotides into the sample DNA are preferred. Preferably the reporter molecules are fluorophores, more preferably are of the cyanine group of fluorophores. Most preferably, the DNA is labelled with Cy3, Cy5 and/or Alexa Fluor 647 and Alexa Fluor 546. The ratio of bases to dye molecules (BDR) is preferably less or equal to 60.

The detection of the reporter molecule in the method of embodiment (3) of the invention is preferably done by using a suitable detection system for the bound reporter molecule. This detection system is preferably based on visualization of the reporter molecule, more preferably on fluorescence detection. Furthermore, the detection is preferably done by a microarray scanner or microarray reader.

In the method of embodiment (3) of the invention, the DNA microarray can be substituted by any other solid support onto which DNA gene probes are attached in a way permitting hybridisation of the DNA in the sample and subsequent detection of the bound DNA. This includes the use of microtiter plates coated with one or several DNA gene probes per well, of glass surfaces (like, e.g., microscopic slides) with DNA spots, of filter paper disks, membranes, gold electrodes and beads (particles with a diameter of from 1 nm to several µm made of glass, plastic, metal etc.) coated with DNA, etc.. The beads are preferably used in a multi-chamber system, more preferably in a microfluidic multi-chamber system, wherein each chamber contains a population of beads. Each bead has an attached DNA sequence and the whole beads population in one chamber will carry the same DNA sequence, each chamber corresponding then to a specific capture probe. The target DNA to be analysed flows through the multi-chamber system and will hybridize with the complementary DNA sequences attached to the beads. Beads could be also attached to a surface by magnetic force, i.e. paramagnetic beads coupled with DNA could be attached on the surface of the magnet and arrange in a lattice structure. Complimentary, beads made of a magnetic material could be attached to an iron surface.

The use of the DNA coated beads or of a DNA microarray of embodiment (1) is preferred. The use of a DNA array is especially preferred.

Thus, in one preferred aspect, in the method of embodiment (3) the analytical device is a DNA microarray. In this case, the detection is preferably performed using a DNA microarray reader. In a second preferred aspect, the analytical device is a DNA coated bead or a set of DNA coated beads (plurality of DNA coated beads). In this case, the application and/or detection step is preferably performed in a microfluidic device.

The kit of embodiment (4) of the invention may additionally comprise reagents for the labelling reactions of embodiment (3) and/or reagents necessary for the hybridisation step of the method of embodiment (3).

The present invention is described in more detail by reference to the following examples. It should be understood that these examples are for illustrative purpose only and are not to be construed as limiting the invention.

Examples

In the experimental examples described below, standard techniques of recombinant DNA technology were used that were described in various publications, e.g. Sambrook et al. (1989), Molecular Cloning: A Laboratory Manual, Cold Spring Harbor Laboratory, or Ausubel et al. (1987), Current Protocols in Molecular Biology 1987-1988, Wiley Interscience. Unless otherwise indicated, all enzymes and kits were used according to the manufacturers´ specifications.

Example 1.1: Materials and Methods

Reference strains, clinical isolates and culture conditions: Bacterial reference strains were obtained from the American Type Culture Collection (ATCC, Manassas, Va.), the Deutsche Sammlung von Mikroorganismen und Zellkulturen (DSMZ, Braunschweig, Germany) or the network on antimicrobial resistance in *Staphylococcus aureus* (NARSA, Herndon, Virginia). Clinical isolates were obtained from the inventors´ clinical routine microbiology laboratory.

The following bacteria were used for evaluation of the specificity of the microarray in Examples 1.2-1.10: *Staphylococcus aureus* (ATCC 25923, NRS123 alias MW2, 5 clinical isolates), *Staphylococcus epidermidis* (5 clinical isolates), *Staphylococcus capitis* (clinical isolate), *Staphylococcus haemolyticus* (clinical isolate), *Staphylococcus hominis* (clinical isolate), *Staphylococcus warneri* (clinical isolate), *Staphylococcus auricularis* (clinical isolate), *Micrococcus* spp. (clinical isolate), *Escherichia coli* (ATCC 25922, 6 clinical isolates), *Pseudomonas aeruginosa* (ATCC27853, 5 clinical isolates), *Klebsiella pneumoniae* (3 clinical isolates), *Proteus mirabilis* (2 clinical isolates), *Serratia marcescens* (2 clinical isolates), *Enterobacter cloacae* (clinical isolate), *Enterobacter aerogenes* (clinical isolate), *Acinetobacter baumannii* (clinical isolate), *Stenotrophomonas maltophilia* (clinical isolate), *Enterococcus* spp. (clinical isolate), *Enterococcus faecalis* (clinical isolate) and

Streptococcus pneumoniae (clinical isolate). Bacterial strains and clinical isolates were grown over night at 37 °C with constant shaking in 5 ml Luria-Bertani (LB) broth or tryptic soy broth (TSB, 30 g/l, Merck) containing 3 g/l yeast extract. Enterococci and streptococci were grown in 10 ml TSB plus yeast without agitation under 5% CO_2. Overnight cultures were harvested at 2,560 g for 10 min. After discarding the supernatant the pellet was washed in 1 ml TE (10 mM Tris-HCl, pH 7.5 and 1 mM EDTA) and recovered by centrifugation at 17,900 g for 10 min. Cell pellets were used for DNA preparation.

Blood cultures: Aerobic and anaerobic blood culture bottles (BACTEC®, Becton Dickinson, Heidelberg, Germany) were inoculated with blood from patients with suspected sepsis and placed in a BACTEC® 9240 blood culture system (Becton Dickinson), a continuous-reading, automated, and computed blood culture system that detects the growth of microorganisms by monitoring CO_2 production. Incubation was performed according to the manufacturer's recommendations. Bottles with a positive growth index were removed from the incubator, and aliquots of 1 ml of the blood culture suspensions were taken aseptically with a needle syringe. 1 ml-aliquots of the blood culture suspensions were mixed with 1 ml 0.1% Triton®-X-100 and kept at room temperature for 5 min in order to disrupt human blood cells. Bacterial cells were then harvested at 17,900 g for 10 min, pellets were washed in 1 ml TE, recovered by centrifugation and used for DNA preparation. For conventional identification and susceptibility testing, a second 1 ml-aliquot was examined by Gram-stain and subcultured on agar plates. The organisms grown on agar plates were characterised and tested for susceptibility using a VITEK-2 system (bioMérieux, Inc., Nürtingen, Germany), Etest strips (AB BIODISK, Solna, Sweden) or disk diffusion tests following the method recommended by the National Committee for Clinical Laboratory Standards (NCCLS) (Standards, N.C.f.C.L., Approved standard M2-4a, Villanova, PA (1990)).

For microarray hybridisation experiments, DNA was prepared from 13 blood cultures positive for *S. aureus* (4), *S. epidermidis* (3), *S. pneumoniae* (2), *P. aeruginosa* (1), *E. coli* (2) and *P. mirabilis* (1).

Example 1.2: DNA preparation

Total cellular DNA was extracted and purified either by using the First-DNA All-tissue kit (GEN-IAL GmbH, Troisdorf, Germany) following the instructions of the supplier or by enzymatic lysis followed by phenol/chloroform extraction. For the latter protocol, cell pellets were resuspended in 500 µl lysis buffer (20 mM Tris-HCl, pH 8.0, 2 mM EDTA, pH 8.0, and 1.2% Triton®-X-100) and lysozyme (Sigma, Taufkirchen, Germany) was added to reach a final concentration of 0.8 mg/ml. In addition, lysostaphin (Sigma) was added to a final concentration of 0.2 mg/ml to promote staphylococcal lysis or mutanolysin (0.5 U/µl; Sigma) was added to lyse Streptococci and Enterococci. After incubation at 37°C for one hour, cell lysates were treated with Proteinase K (1 mg/ml; Sigma) for 1 hour at 55°C and then with RNase A (0.2 mg/ml; Qiagen, Hilden, Germany) for 1 hour at 37°C. The volume was increased by the addition of 200 µl TE and the salt concentration was adjusted to 0.7 M by addition of 5 M NaCl. A 10% CTAB (cetyltrimethylammonium bromide) solution in 0.7 M NaCl was added to a final concentration of 1% and incubated at 65°C for 20 min in order to release DNA from polysaccharide DNA complexes. DNA was then extracted once with phenol/chloroform/isoamyl alcohol (25:24:1) and once with chloroform/isoamyl alcohol (24:1) prior to precipitation with one volume of isopropanol. After centrifugation at 17,900 g for 30 min, DNA pellets were washed in 70% ethanol and resuspended in 50-100 µl TE.

Concentration, purity and size of the purified DNA preparations were determined by UV-spectrophotometry (lambda 40, PerkinElmer, Boston USA) and 1% agarose gel electrophoresis.

Example 1.3: DNA labelling

Total DNA from commercially available reference strains, clinical isolates and blood cultures was labelled by a non-enzymatic chemical labelling method using the Label It Cy3/Cy5 kits (Mirus, Madison, USA) or the ULYSIS Alexa Fluor 467 Nucleic Acid Labelling Kit (Molecular Probes; Eugene, USA). Prior to labelling, each target DNA was spiked with three gene segments (1 µl each, 30 ng/µl) amplified by PCR from selected recombinant plasmids to serve as internal positive controls.

For labelling with the Label It Cy3/Cy5 kit 5 µg of high molecular weight DNA (>20 kb) were mixed with 7.5 µl reagent in a total volume of 50 µl and incubated for 2 hours at 37°C according to the recommendations by the supplier. After adjusting the volume to 200 µl with H_2O and adding 0.1 volume of 5 M NaCl, unbound label was removed by precipitation with 2 volumes of ice-cold absolute ethanol for at least 30 min at -20°C. The labelled DNA was recovered by centrifugation at 17,900 g for 30 min. The pellet was washed with 70% ethanol and resuspended in 70 µl TE.

For labelling with the Ulysis Alexa Fluor 647 kit, 1 µg DNA was denatured at 95°C for 5 min, cooled on ice, mixed with 20 µl labelling buffer and 5 µl reagent and incubated at 80°C for 15 min according to the instructions of the manufacturer. Unbound dye was removed by ethanol precipitation as described above. The relative labelling efficiency of a reaction was evaluated by calculating the approximate ratio of bases to dye molecules (acceptable labelling ratios for nucleic acid were ≤60). This ratio and the amount of recovered labelled DNA was determined by measuring the absorbance of the nucleic acids at 260 nm and the absorbance of the dye at its absorbance maximum using a lambda40 UV-spectrophotometer (PerkinElmer) and plastic disposable cuvettes for the range from 220 nm to 1,600 nm (UVette; Eppendorf, Hamburg, Germany).

Example 1.4: Microarray construction

Cloned PCR-products were used to generate probes for the DNA microarray. All together 120 gene segments representing virulence genes, antibiotic resistant determinants and species specific metabolic and structural genes from *S. aureus* (40), *E. coli* (31) and *P. aeruginosa* (49) were represented on the microarray (Tab. 2).

Tab. 2: Gene probes with SEQ ID NOs, function, gi numbers and primer sequences. *E. coli* gene probes (1-31), *P. aeruginosa* gene probes (32-80), *S. aureus* gene probes (81-120).

Array No.	**Symbol**	**Function**	**gi number**	**gene probe SEQ ID NO**	**Primer forward [SEQ ID NO]**	**Primer reverse [SEQ ID NO]**
1	*envZ*	Inner membrane osmosensor	453286	143	AGCCTGGTGACGACTTATC [1233]	ATCCGCCAGTTGCTTAAC [1234]
2	*fes(2)*	Enterochelin esterase (siderophore)	145916	161	TGTTTCTGCACTCGAAATG [1269]	GGCAATAGCTTTCACCAG [1270]
3	*fes(1)*	Enterochelin esterase (siderophore)	145916	160	TGTTTGAGGTCACTTTCTGG [1267]	CAATAGCTTTCACCAGGG [1268]

4	*nfrB*	Bacteriophage N4 receptor, inner membrane protein	16127994	145	ATGGAATTGCGTCTGTTC [1237]	AAGTTTAGCCACAGCAGG [1238]
5	*yacH*	Putative membrane protein	16127994	148	GACTCGGTACAGCGATTG [1242]	CTGACGTTGGGTATCTCG [1243]
6	*yagX*	Putative enzyme	16127994	149	CTTTACGACGGTTCTCCC [1244]	AATCTTCCCTGCTGAAATG [1245]
7	*ycdS*	Putative outer membrane protein	16127994	150	TTGAAACTTCTTACTGCCG [1246]	AATTTCTAATGCAGCGTATTG [1247]
8	*b1169*		16127994	142	GTTTGGGACTTATTGCTCTG [1230]	CATCAGCCACAGTTTCAAG [1231]
9	*b1202*	Putative outer membrane protein	16127994	153	GAATACCAAAGCAGATCGTC [1252]	CCGAGATCGACAACAGAG [1253]
10	*fliCb*	Flagellar H antigen	8071787	144	ACCACGACAGGTCTTTATG [1234]	AGAGAGGCACCGTCACTAC [1235]
11	*iucA*	Aerobactin synthesis (siderophore)	474189	165	CATCAGGCAGTTATCCTGTC [1276]	AGTCGTCCTCCTGCATTAC [1277]
12	*iucB*	Aerobactin synthesis (siderophore)	474189	166	TTCACAGCGGATATGGAC [1278]	CACTTTGCTCCCAGAAATAC [1279]
13	*iucC*	Aerobactin synthesis (siderophore)	474189	167	AGACTGGGATTTGGTCAAC [1280]	AGACACCATCCTGCCTTC [1281]
14	*papG*	Adhesin, P-pili protein	42307	168	GGAGTATATTGCGTGGGTAG [1282]	AAGATTCACCATAGAGGCG [1283]
15	*yciQ*	Putative membrane protein	16127994	151	ATAGCAGGGCTGTTTGTATC [1248]	GACACGGAAACCAAATTAAC [1249]
16	*ymcA*	Hypothetical protein	16127994	152	TATTGTCATCGCGCAGAG [1250]	TGTTGGGTTGAAAGAGTAGC [1251]
17	*eae*	Genetic locus necessary for the production of attaching and effacing lesions on tissue culture, OM protein adhesin	145852	154	CTAACTCATTGTGGTGGAGC [1254]	CTTGTCATCGGTCATGTTG [1255]
18	*eltB*	Enterotoxin subunit B	145830	155	GGCGTTACTATCCTCTCTATG [1256]	TTTCCATACTGATTGCCG [1257]
19	*escR*	Secretion	2897961	156	TTTGTTGTTATTGGTACTTCATTC [1258]	ATCGAAATTGTTACTGGCG [1259]
20	*escT*	Secretion	2897961	157	TTACGCTTCCGATCATAGTAG [1260]	GAATACGTTTAGTTGAGGCG [1261]
21	*escU*	Secretion	2897961	158	AAGTGAAGAGGTAATGGCTG [1262]	TACCATCAGTATCCTTGGC [1263]

22	*espB*	Protein secreted by enteropathogenic E. coli	1657262	159	GATGGTGACTCTATTGCAGG [1264]	CCATACGATTCTGGACCTC [1265]
23	*hlyA*	Enterohemorrhagic Escherichia coli hemolysin	525328	163	CTTGGAAATGTTGGTAAAGC [1272]	TAAACTCCTTCGGTTGAGC [1273]
24	*hlyB*	Enterohemorrhagic Escherichia coli hemolysin	1247757	164	TCAATGCTGAAACTATAAGGC [1274]	ACTTAGCACCCAGTTCGAC [1275]
25	*SLTII*	Shiga-like toxin type II	304950	171	TTCTTCGGTATCCTATTCCC [1288]	TGTGAGGTCCACTTCTTCC [1289]
26	*toxA-LTPA*	Subunit A of heat-labile enterotoxin	148027	172	AAATGGCGACAAATTATACC [1290]	CTGGGTCTCCTCATTACAAG [1291]
27	*VT2vaB*	Verotoxin-2 variant, beta-subunit, shiga-like toxin	148261	173	AAGAAGATGTTTATGGCGG [1292]	GATTCACAGGTACTGGATTTG [1293]
28	*aacC2*	aminoglycoside-(3)-N-acetyltransferase	45769	833	GACCGATCACCCTACGAG [2612]	CGAAATGCTTCTCAAGATAGG [2613]
29	*blaTEM-106*	Class A beta-lactamase	21464484	815	ACATCGAACTGGATCTCAAC [2576]	TCTCAGCGATCTGTCTATTTC [2577]
30	*strB*	Streptomycin resistance protein B	17129524	834	AAGTTTCATTGCCAGACG [2614]	TAGACTGCGTTGCTCCTC [2615]
31	*sul*	Dihydropteroate synthase, sulfonamide resistance	17129524	887	CATCGTCAACATAACCTCG [2720]	AATTCTTGCGGTTTCTTTC [2721]
32	*algB*	Alginate biosynthesis (exopolysaccharide)	150990	494	CACTTTCCGTTATTGCCTC [1934]	GAGGATGAGGATGTTGGC [1935]
33	*algN*	Alginate biosynthesis (exopolysaccharide)	150999	495	GACTGGCTGAATCGTCTC [1936]	GCAGGTCGTACCAGGAAG [1937]
34	*algR*	Alginate biosynthesis (exopolysaccharide)	151003	496	ATTGTCGATGACGAACCTC [1938]	TTCAGGTAGAGCTGGAAATG [1939]
35	*aprA*	Alkaline protease	45279	491	CATTGAAAGGTCGTAGCG [1928]	CGACGAAGTGGATATTGG [1929]
36	*aprE*	Alkaline protease secretion	45279	492	GGTCAAGCACATCCTAGTG [1930]	ACTTCCTTGCGGTACTCC [1931]

37	*glpR*	Repression of glycerol metabolic enzymes (glp=glycerol-3-phosphate)	1399486	470	CAAGCACAACAAGAAATACG [1886]	TAGACCTCCGAAGAGTTGC [1887]
38	*lasRa*	Elastase, virulence protein	309873	499	CTGGGACGTTAGTGTCATC [1944]	GTCTTGGCATTGAGTTCG [1945]
39	*lasRb*	Transcriptional activator of elastase	151325	471	GAGCGACCTTGGATTCTC [1888]	ATAAGACCCAAATTAACGGC [1889]
40	*lipA*	Extracellular triacylglycerol lipase	45340	500	AAGAAGTCTCTGCTCCCC [1946]	ACGATTTCCTCCACCTGT [1947]
41	*lipH*	Lipophilic protein necessary for the expression of active lipase	483463	501	ATGGCAGTTTCAGTGTCG [1948]	CGAAATAGTCGTCCAGCC [1949]
42	*mexA*	Multidrug resistance protein MexA precursor	5616092	889	CTCGACCCGATCTACGTC [2724]	GTCTTCACCTCGACACCC [2725]
43	*Orf252*	DnaJ-like protein	4545242	503	GACCTGCTGTTCCAGTTG [1952]	AATTCACGGGTTTTCTCG [1953]
44	*OrfX*	Regulatory protein, glycerol metabolism	1399486	472	ATGGATGCTCGGGTACTG [1890]	CTCAGCTACAGCCACGAC [1891]
45	*pa0260*	Hypothetical protein	15595198	473	GATCGTCTCTGCCCAGTC [1892]	ACATTGATGGTGTCGTCC [1893]
46	*pa0572*	Hypothetical protein	15595198	474	AGGAGAGAACATGAGTCGC [1894]	TCCTTGTCCCAGTAGTTACC [1895]
47	*pa1046*	Hypothetical protein	15595198	477	AGGCATCCATCGAGCTAC [1900]	AACGTCCGAGCAGGATAC [1901]
48	*pa1069*	Hypothetical protein	15595198	478	GCGAGGAGGTATTCGACA [1902]	CCCTTCTGCGAGTAGTGTT [1903]
49	*pa1846*	Hypothetical protein	15595198	479	AAGGACTTCTGGTCGGTG [1904]	CAGGAACAGGTGCTCGTAG [1905]
50	*pa4082*	Hypothetical protein	15595198	481	CGAGCACCAATATCGAAC [1908]	GAGCCGTAGGTGTTATCG [1909]
51	*pchG*	Necessary for formation of siderophore pyochelin	4325021	504	CCTGCTCAACACCTTCTATC [1954]	GTCGAACAACGCGAACAG [1955]
52	*PhzA*	Phenazine biosynthesis proteins (low molecular weight toxins)	5616088	505	GTTGAAAGGGTTTACCGAC [1956]	AATTTCTGCATCGGGTTC [1957]

53	*PLC*	Phospholipase C (heat labile-hemolysin)	151492	507	GACTTCGCTGTTCGACTTC [1960]	TCGGTTCGAGTTCATAGC [1961]
54	*plcN*	Non-hemolytic phospholipase C	151497	508	GTGTTCCAGGTGTTCGAC [1962]	GATAGACGTTGTCCTTGACC [1963]
55	*plcR*	Phospholipase C regulation	151499	509	ACAACCTGGAACAGCAACT [1964]	CGACTCTTGCGCGTATTC [1965]
56	*PstP*	Phosphoenolpyruvate-protein phosphotransferase	4545246	485	GAAGTGAACTCCGCCAAG [1916]	TCGAGCATCATCAGGTAGAC [1917]
57	*purK*	AIR carboxylase II, purine biosynthesis	1621599	486	TCGAGAAGTCGATGTTCAAG [1918]	CTTGCCGTAGTGATGCAG [1919]
58	*rhlA*	Rhamnosyl-transferase involved in rhamnolipid biosurfactant synthesis	452502	518	AGTCTGTTGGTATCGGTTTG [1982]	CTCCAGGTCGAGGAAATG [1983]
59	*rhlR*	Rhamnolipid regulation	1117916	520	TTCGATTACTACGCCTATGG [1986]	GGTCCATTGCAGGATCTC [1987]
60	*toxA*	Exotoxin A precursor	15595198	522	GTGCGCTACAGCTACACG [1990]	CTTGCCTTCCCAGGTATC [1991]
61	*uvrDII*	DNA helicase II UvrD	3249556	487	AGACCTACAACAAGGTTTCG [1920]	TGAGGATAGTCCCTTCGC [1921]
62	*vsmI*	Autoinducer synthesis protein	695153	488	ATTCCTCTCTGAATCGCTG [1922]	AATATCTTCATCGCCAGTTG [1923]
63	*xcpX*	Secretion protein, translocation of exoproteins across outer membrane	45433	490	TTCAACCTCAACGGACTG [1926]	TGCAAGGTACTCACCAGC [1927]
64	*ExoS*	Exoenzyme S, secreted toxin	13892017	497	CGTTTGGGACAGATTGAG [1940]	GATACTCTGCTGACCTCGC [1941]
65	*fpvA*	Ferripyoverdine receptor	1633044	498	AATGCGATAACCATCAGC [1942]	CCGTCGTACTGGAAGTTG [1943]
66	*pa0625*	Hypothetical protein	15595198	475	AGGAGCAACTGAAGCGAC [1896]	TCTGCCTTTACCCAGGAC [1897]
67	*pa0636*	Hypothetical protein	15595198	476	AAGGTTGGCAGGATCAAC [1898]	CTAGTGGCGAAATTGAACAG [1899]
68	*pa3866*	Hypothetical protein	15595198	480	TTCCCTAACGAATGCTGTC [1906]	CGTTGCTCCCTCATACAC [1907]
69	*PhzB*	Phenazine biosynthesis proteins (low molecular weight toxins)	5616088	506	ATGCTCGATAATGCTATTCC [1958]	TTCTCGTAGTAACCCTCGG [1959]

70	*pilAp*	Type IV pilin, involved in twitching motility and attachment	18535593	482	GCTTTACCTTGATC GAACTG [1910]	TCAATAGAGCCAGTC ACACC [1911]
71	*PilAp2*	type IV pilin, involved in twitching motility and attachment	21629637	483	TGCCGTGAGTGAA ATCAG [1912]	CGTAGTTGGCTTTCC AGTT [1913]
72	*pilC*	Pilin biogenesis protein	18535591	484	GGTATCAACCCACT AAAGGTC [1914]	GTCCAGAGCTTCTAC CAGAG [1915]
73	*pvdD*	Pyoverdine synthetase D (siderophore)	1633044	510	GTCAAGGGTGTTG TCTGC [1966]	CTCTGCACAAACTCA GGG [1967]
74	*pyocin S1*	PyocinS1, bacteriocin	286179	512	CTTCAGTTCCGAGA TGCC [1970]	GTAACGAACGCTATC GGG [1971]
75	*pyocin S1im*	Immunity protein of pyocin S1	286179	513	ATATACGGAAAAAG AGTTTCTTGAG [1972]	AGCACGCCATTCTTT AACTTC [1973]
76	*pyocin S2*	PyocinS2	286182	514	TATACGGCTTCAGA CTTTCC [1974]	TGGCATAAGTATTGG CAG [1975]
77	*pys2(1)*	PyocinS2	15595198	515	TCGCCAATAAGAAG AAATTG [1976]	AGTGGTACTCGAAG GGTTCT [1977]
78	*pys2(2)*	PyocinS2	15595198	516	ATCCAGTATATTCC TGCTCG [1978]	TGCAATTTCTTCTTAT TGGC [1979]
79	*rbf303*	B-band LPS (O-antigen) biosynthesis	836903	517	ATCGTTCTGGTCTT CCTTG [1980]	ACCAAAGAGTGTTGA TAGCC [1981]
80	*rhlB*	Rhamnosyl-transferase involved in rhamnolipid biosurfactant synthesis	452502	519	AACGCTTTCTCGAT CAGG [1984]	GATACTGTGCGGTTG TGA [1985]
81	*femA*	Factor essential for methicillin resistance	4929298	801	TACAGTCATTTCAC GCAAAC [2548]	TCACGCTCTTCATTT AGTTCT [2549]
82	*fmhA*	Factor essential for methicillin resistance	4574232	825	TGACTTCGGATGA GTTCAAT [2596]	GCTGTTAATTGTTGT TGCTTT [2597]
83	*fmhB*	Factor essential for methicillin resistance, putative	4574234	818	CTCACCCAAATGGA GATTTA [2582]	CTTGCTTTTCAGATG TTTCC [2583]
84	*gyrA*	DNA gyrase subunit A	296393	60	AGGCTCGTATGATT GAAAAA [1066]	GGTTTTGAGCACGAT ATGTAG [1067]
85	*gyrB*	DNA gyrase subunit B	296393	61	TTGGCACAACTGAT AAGACA [1068]	AAAAATCGTTCAAAG TGCTC [1069]

86	*hemB*	Porphobilinogene synthase	2589180	62	ATCATCAGCGACAATGAGAG [1070]	TTTTTAACATCTCGAACTATATCTAA [1071]
87	*hemN*	Oxygen-independent coproporphyrinogen oxidase	14349226	65	TCTTCCATTCTCTCAGTCAAA [1076]	AGACCATGTATGTAGGTGGC [1077]
88	*hla*	α-Hemolysin	46763	120	GTCAGCTCAGTAACAACAACAC [1186]	GTAGCGAAGTCTGGTGAAAA [1187]
89	*lip*	Lipase	393265	68	TGCATCTTCCATTTTAATAGC [1082]	GTCATTGTCCTTTGTTGGTT [1083]
90	*menC*	o-Succinyl-benzoic acid synthetase	1255258	69	TTGACAGCTTTGCATTTTTA [1084]	GGCTTTGTTGCTTTTAATGA [1085]
91	*NAG*	N-acetyl-glucosaminidase	2506026	125	AAGTTGCTCAAATACAAGCTG [1196]	TGATGTTAGCCCAATCTACA [1197]
92	*norA23*	Quinolone resistance protein	4115706	904	GGTTACTTGTTGCTGCTTTT [2754]	CGTAATCGCAATCGAAATA [2755]
93	*nuc*	Nuclease	46623	71	TGGCTATCAGTAATGTTTCG [1088]	GAATCAGCGTTGTCTTCG [1089]
94	*rpoB*	RNA poly-merase B-subunit	677848	73	TGGAAGACATCGTAAACGTA [1092]	TGGATCAAAGAAACGTGAAT [1093]
95	*tag*	DNA-3-methyladenine glycosidase	6434027	81	TTTTGATTTATCTTCTGACGG [1108]	CATTCATTTTATTCCCACCT [1109]
96	*16SSa*	16S rRNA	46498	942	TCTCTGATGTTAGCGGCGG [2830]	TCAGGCTTTCGCCCATT [2831]
97	*clfB*	Clumping factor B	3393010	4	TAGCATAGCAACAAACAGTGA [954]	GTTTTGACCTGAAGCTGTATC [955]
98	*EDIN*	Epidermal cell differentiation inhibitor	152997	113	AAAGATAGTTCTAAGATAAATGGTC [1172]	GGCCATTATTGGTCTGTTG [1173]
99	*elkT-abcA*	Lantibiotic epilancin K7 tranlocator	1841513	896	ATTAGAAATTGCGACTGGTG [2738]	AGCGTGTCATATCCTTCATC [2739]
100	*epiP-bsaP*	Biosynthesis of lantibiotic epidermin; serine protease	21204850	58	CTTAGATGTCCCATGCTGAT [1062]	GTCAAACGAGTGCTAATGGT [1063]
101	*geh*	Lipase precursor; glycerol ester hyderolase	153019	59	TTCAATAGGCGTGGTGTC [1064]	TTATCTGTCGGTTTCTCTGG [1065]
102	*mreA*	ABC transporter	7548683	907	TACGATGACACCAGTCTTTG [2760]	ATCGACAAAACGTACAGGAT [2761]
103	*murC*	UDP-N-acetylmuramoyl-L-alanine synthetase	2642658	70	GTATTATTGCTTGGGGTGAT [1086]	GGATATTTCTTTCGTGCTGT [1087]

104	*sak*	Staphylokinase	47425	126	TGTTATTATTCTCA TTTTCTTCAAT [1198]	ATGCTCTGATAAATC TGGGA [1199]
105	*sea*	Enterotoxin A	153120	127	TTTTATTCATTGCC CTAACG [1200]	TTTTCAGAGTTAATC GTTTTATTATC [1201]
106	*sec1*	Enterotoxin C	46566	129	AATTTTTGGCACAT GATTTA [1204]	CTTTTATGTCTAGTT CTTGAGCTG [1205]
107	*etb*	Exfoliative toxine B precursor	153011	115	TTTTAGCAGCGTCA ATTTTT [1176]	CTGATCCAGAGTTTC CTACCT [1177]
108	*seb*	Enterotoxin B	152999	128	CGTAGATGTGTTTG GAGCTA [1202]	CTTGAGCAGTCACCT TTTTC [1203]
109	*sstC*	Iron transport protein	3724154	80	TGATATTGGAAGAT ATTAGCATAGA [1106]	TGACAATCGCTTTAT TCATTT [1107]
110	*tst*	Toxic shock syndrome toxin	18266750	138	TTTTTATCGTAAGC CCTTTG [1222]	CAATAACCACCCGTT TTATC [1223]
111	*aacA-aphD*	Bifunctional aminoglyco-side modifying enzyme	3676412	843	AGATTTGCCAGAAC ATGAAT [2632]	TGTTGCATTTAGTCT TTCCA [2633]
112	*aadD*	Aminoglyco-side acetyl transferase	21623792	837	GCTATTGGTGTTTA TGGCTC [2620]	CTGATTGCTTAACTG CTTCA [2621]
113	*aph-A3*	3'5'-amino-glycoside acetyl-transferase	1272325	840	GAGAATATCACCG GAATTGA [2626]	GCTCGACATACTGTT CTTCC [2627]
114	*blaZ*	ß-lactamase	1575124	827	TGCTTTAGTTTTAA GTGCATGT [2600]	TCCTTCATTACACTC TTGGC [2601]
115	*cat*	Chloramphenicol acetyl-transferase	46651	862	AGAAAATTGGGATA GAAAAGAA [2670]	CTGCAAGGCAACTG GTAT [2671]
116	*dfrA*	S1 dihydro-folate reductase	3676404	859	CAATTACCTTGGCA CTTACC [2664]	CCCTTTTCTACGCAC TAAAT [2665]
117	*ermA*	rRNA methylase	13785452	852	CCAGAAAAACCCTA AAGACA [2650]	AAAGAACACGATATT CACGG [2651]
118	*ermC*	Adenine methylase	4138444	846	ACACAGTCAAAACT TTATTACTTCA [2638]	CAACAAGTTTATTTT CTGTAGTTT [2639]
119	*msrSA*	Macrolide antibiotic resistance	3892641	854	GACAGATTTTCGAT CCCTTA [2654]	CCTTTTTGTTTTGAT GCACT [2655]
120	*mecA*	Penicillin binding protein 2'	13785452	802	AGTTGTAGTTGTCG GGTTTG [2550]	TGAAGTCGCTTTTCC TAGAG [2551]

S. aureus, *E. coli* and *P. aeruginosa* genes were selected from the literature and databases, and compared by BLAST analysis to all other sequences available in the

NCBI database. Primers were designed to amplify gene segments of 200-810 bp length and devoid of apparent homology with genes of other bacterial species and *Homo sapiens*. Gene segments were amplified by using the puReTaq Ready-To-Go PCR beads (Amersham Biosciences, Freiburg, Germany) and cloned into the pDrive Cloning Vector (Qiagen, Hilden, Germany) according to the recommendations of the suppliers and transformed into competent *Escherichia coli* (XL-1-Blue) cells using the calcium chloride protocol (Sambrook, J., Russel D.W., Molecular Cloning: A Laboratory Manual. Cold Spring Harbor Laboratory Press, NY (2001)).

For quality control purposes, all gene probes were partially sequenced and verified (with the BigDye kit 1.1 and an 377 DNA sequencer; Applied Biosystems, Foster City, USA). All sequences obtained were identical or substantially identical (>90% sequence identity) to those obtained from the database.

For DNA-probe production 120 recombinant plasmids containing *S. aureus*, *E. coli* and *P. aeruginosa* gene segments were used for re-amplification. Amplicons were purified and spotted in 4 replicates per slide on UltraGAPS™ Coated Slides (gamma amino propyl silane coated slides, Corning, NY, USA). Approximately 1 nl DNA (with a concentration of about 0.1 to about 0.2 ng/nl) per spot was spotted onto the slide with a Biorobotics Microgrid Microarrayer (Genomic Solutions, Ann Arbor, MI, USA).

Example 1.5: Hybridisation and scanning

All experiments described represent dual co-hybridisations of two different target DNA samples labelled respectively with Cy3, Cy5 or Alexa647. After removal of unbound label, Cy3 and Cy5/Alexa647 labelled DNAs were pooled and mixed with 10 µg of Salmon Sperm DNA and 50 µg of poly-A-DNA. The mixture was frozen in liquid nitrogen and lyophilised in the dark. Prior to hybridisation the target DNA was reconstituted in 33 µl H_2O and 55 µl 2x hybridisation solution (Memorec Biotec GmbH, Cologne, Germany) and chemically denatured with 11 µl denaturation buffer D1 (Mirus) and neutralized with 11 µl buffer N1 (Mirus) according the instructions of the supplier. Hybridisation was automatically performed with a TECAN Hybridisation Station (HS400, TECAN, Salzburg, Austria). The arrays were prewashed at 60°C for 1 min with 0.2% SDS and 4x SSC and prehybridised in 120 µl denatured prehybridisation buffer (Memorec) for 30 min at 60°C at mild agitation. After injection of 110 µl labelled DNA, hybridisation was performed at 60°C for 18 hours at mild agitation. The arrays were washed at 50°C in primary wash buffer (Memorec) - five cycles of 1 min wash time and 30 s soak time - and in secondary wash buffer (Memorec) - five cycles of 20 s wash time and 30 s soak time -, and finally dried at 30°C with N_2 (2.7 bar) for 3 min. Hybridised arrays were scanned with a Scan Array 5000 laser scanner (PerkinElmer). Laser light of wavelengths at 532 and 635 nm was used to excite Cy3 dye and Cy5/Alexa647 dye, respectively. Fluorescent images were analysed by the ImaGene software (BioDiscovery, El Segundo, CA, USA).

Example 1.6: Specificity

In order to allow the simultaneous and rapid identification of *S. aureus*, *E. coli* and *P. aeruginosa* grown in blood culture specimens from septicemic patients, a microarray comprising a set of 40 *S. aureus*, 31 *E. coli* and 49 *P. aeruginosa* gene probes of 200 to 810 bp length was developed (Tab. 2).

The specificity of the DNA-chip was validated firstly (compare Example 1.1) with 45 well characterised clinical isolates and reference strains of the three target species as well as other related bacteria and secondly (compare Example 1.2) with 13 blood cultures from sepsis patients.

In all assays, three PCR-amplified DNA-segments, which had been added to each DNA preparation as a positive control, hybridised with the corresponding probes, indicating that labelling and hybridisation had performed efficiently.

Hybridisation experiments with *S. aureus*, *E. coli* and *P. aeruginosa* target DNAs, respectively, revealed specific hybridisation with the species-specific gene probes (Fig. 1). There was no cross-hybridisation between the three species with the exception of the *S. aureus* 16S rRNA gene probe (16SSa, Fig. 1C), which hybridised also with *E. coli* and *P. aeruginosa* target DNA.

Identification of *E. coli*, *P. aeruginosa* and *S. aureus* reference strains, clinical isolates and blood cultures (BC) by microarray analysis corresponded by 100% with the conventional identification results (Fig. 1).

Example 1.7: Detection and discrimination

Example 1.7A: Detection and discrimination of *E. coli*

All DNA samples from 9 *E. coli* strains hybridised always with seven *E. coli* gene probes (*envZ*, *fes* (1) and (2), *nfrB*, *yacH*, *yagX*, *ycdS*) (Fig. 1A, columns 19 to 27);

in the following these genes are designated as core genes. With 14 *E. coli* gene probes variable hybridisation was observed including the antibiotic resistance gene probes *bla-TEM106*, *sul*, *strB* and *aacC2*. Such a variable hybridisation profile is expected for antibiotic resistance genes since acquired resistance to antimicrobials is strain specific. For 11 *E. coli* virulence gene probes (*eae*, *eltB*, *escR*, *escT*, *escU*, *espB*, *hlyA*, *hlyB*, *SLTII*, *toxA-LTPA*, *VT2vaB*) no hybridisation signals were detected with any of the tested *E. coli* isolates and blood cultures. Since these virulence genes are known to be specific for particular *E. coli* pathotypes (Bekal, S. et al., J. Clin. Microbiol., 41:2113-25 (2003)), it was not surprising that they were not present in the tested strains. The *eae*, *esc* and *esp* genes for example are encoded on a chromosomal pathogenicity island, which is typical for enteropathogenic *E. coli* exhibiting the unique virulence mechanism known as attaching and effacing (AE) (Elliott, S.J. et al., Mol. Microbiol., 28:1-4 (1998)). The alpha-hemolysin (*hly*) operon is encoded on a large plasmid of enterohemorrhagic *E. coli* strains (Schmidt, H. et al., Infect. Immun. 63:1055-61 (1995)).

Example 1.7B: Detection and discrimination of *Pseudomonas aeruginosa*

DNA samples obtained from *P. aeruginosa* uniformly hybridised with 32 out of 49 *P. aeruginosa* specific gene segments including the *mexA* gene probe (core genes). Variable hybridisation was observed with 17 probes allowing for discrimination of individual *P. aeruginosa* isolates (Fig. 1B, columns 12 to 18).

Example 1.7C: Detection and discrimination of *S. aureus*

Hybridisation experiments performed with 11 *S. aureus* target DNAs revealed signals in all assays with 16 *S. aureus* gene segments (core genes) (Fig. 1C, columns 1 to 11). Variable hybridisation was observed with 14 *S. aureus* gene probes including the 6 antibiotic resistance gene segments *aadD*, *aacA-aphD*, *blaZ*, *dfrA*, *ermA* and *mecA* and the virulence genes *sak*, *sea*, *sec1* and *EDIN*. The gene probes *geh*, *mreA*, *clfB* and *elkT-abcA* hybridised with 8, 10 (*mreA* and *clfB*) and 6 target DNAs respectively. However, PCR amplification of the four genes was positive for all 11 *S. aureus* target DNAs (not shown) suggesting that the four genes were present in all strains investigated and that these gene probes did not allow reliable detection of the four genes in *S. aureus*.

No hybridisation was observed with 10 probes including the toxin genes *seb*, *tst* and *etb*. In contrast to the community-acquired, multi-susceptible MRSA strain

MW2 that hybridised to *mecA* and *blaZ* only, all six clinical MRSA strains showed the same multiresistant hybridisation pattern and their DNA hybridised to *ermA* (erythromycin resistance), *mecA* (oxacillin resistance) and the *aadD* gene (tobramycin resistance). As for the majority of multiresistant MRSA strains the *ermA* and *aadD* genes were shown to be located upstream and downstream, respectively, of the *mecA* gene in the *mec* chromosomal region (Chambers, H.F., Clin. Microbiol. Rev., 10:781-91 (1997); Polyzou, A. et al., J. Antimicrob. Chemother., 48:231-4 (2001)). Hybridisation to the core gene probes permitted the identification of *S. aureus*, while hybridisation to antibiotic resistance gene probes allowed for discrimination of strains.

Example 1.7D: Discrimination of *E. coli*, *P. aeruginosa* and *S. aureus* from related bacterial species

Co-hybridisation experiments performed with related bacterial species confirmed the high specificity of the DNA-chip (Fig. 1): For *S. epidermidis* and all other Coagulase-negative staphylococci, cross-hybridisation was observed only with the *S. aureus* 16S rRNA gene probe (16SSa, Fig. 1C) and several common staphylococcal antibiotic resistance determinants (*aadD*, *aacA-aphD*, *aph-A3*, *blaZ*, *cat*, *dfrA*, *ermA*, *ermC*, *mdrSA*, *mecA*) (Fig. 1C, columns 28 to 36). There was no cross-hybridisation with other metabolic or virulence genes of *S. aureus*.

The *Micrococcus* spp. isolate showed no hybridisation with the DNA-chip (column 53). Streptococci (column 56 to 58) and enterococci (columns 54 and 55) showed hybridisation with the staphylococcal 16S RNA gene probe and once with the staphylococcal *aph-A3* aminoglycoside resistance gene probe (*Enterococcus* spp.) (Fig. 1C). Out of 12 strains of seven Gram-negative species (columns 41 to 52), two hybridised with the *S. aureus* 16S rRNA gene probe (*Klebsiella pneumoniae* and *Proteus mirabilis*, Fig. 1C, columns 41 and 47) and one clinical isolate of *Proteus mirabilis* hybridised with the *E. coli* resistance genes *bla-TEM106* (ß-lactam resistance), *sul* (sulfonamide resistance) and *strB* (streptomycin resistance) (Fig. 1A, column 42). *Serratia*, *Stenotrophomonas*, *Acinetobacter* and *Enterobacter* species showed no cross-hybridisation with any gene probe.

Example 1.8: Sensitivity

While the majority of *P. aeruginosa* probes allowed unambiguous identification, some probes showed variable hybridisation patterns when microarray hybridisation was performed with different target DNA samples prepared from the same isolate (Tab. 3).

Tab. 3: Microarray hybridisation signals obtained with different target DNA preparations of *Pseudomonas aeruginosa* isolates.

	Isolate								
	C4242			C3853		C3045		C3755	
DNA amount [ng]	130[a]	382[a]	1350[b]	510[a]	>2400[b]	550[a]	2950[b]	1180[b]	>1600[b]
BDR[c]	22	75	48	29	30	90	41	139	40
No. of hybridised gene probes[d]	38 (88%)	31 (72%)	43 (100%)	36 (88%)	41 (100%)	34 (89%)	38 (100%)	41 (95%)	43 (100%)

[a] Labelled with Alexa647

[b] Labelled with Cy3 or Cy5

[c] BDR: Base to dye ratio; number of nucleotides per one dye molecule

[d] Number of signals obtained with *P. aeruginosa* capture probes (total 49) after hybridisation with different DNA preparations. The percentage of specific hybridisations is compared to the highest number of signals obtained for each isolate (100%).

Successful hybridisation with strong fluorescent signals depends on efficiency of DNA labelling (ratio of bases per one dye molecule) and amount of labelled DNA. For the different target DNA preparations of four clinical isolates, variable hybridisation was observed with 14 gene probes (*uvrDII*, *vsmI*, *pa1069*, *rhlR*, *rhlA*, *rhlB*, *1046*, *pyocinS*, *pyocinS1im*, *plcR*, *plcN*, *PHZb*, *rbf303* and *pIIAp2*). For example, for three different DNA preparations of isolate C4242, hybridisation to *Pseudomonas*-gene probes varied from 31 to 43 probes, respectively, depending on the labelling efficiency and amount of DNA (Tab. 3). The lowest number of signals was detected with 382 ng target DNA, that, however, showed a high base to dye ratio of 75. Overall, the results suggest that varying amounts of DNA and base to dye ratios influenced the hybridisation results of few gene probes. However, irrespective of the varying quality and quantity of the labelled target DNA, 35 of the 49 *P. aeruginosa* gene probes showed robust hybridisation results in all performed experiments.

Example 1.9: Detection and characterisation of pathogens in blood cultures

Although DNA prepared from blood cultures comprises a mixture of human and bacterial DNA, the resulting hybridisation signals obtained with DNA from 1 ml positive blood culture allowed a clear and unambiguous characterisation of *S. aureus*, *E. coli* and *P. aeruginosa* present in 13 tested blood specimens (Fig. 1). In accordance to the VITEK2 characterisation, positive BACTEC® cultures were identified by microarray hybridisation as multi-resistant MRSA (Fig. 1C, column 8), penicillin-resistant *S. aureus* (column 9 and 11), multi-susceptible *S. aureus* (column 10), *E. coli* (Fig. 1A, columns 26 and 27), *P. aeruginosa* (Fig. 1B, column18), and discriminated from oxacillin resistant *Staphylococcus epidermidis* (columns 33-35), *Proteus mirabilis* (column 43) and *Streptococcus pneumoniae* (columns 57 and 58).

Example 1.10: Correlation between susceptibility testing and microarray hybridisation of selected antibiotic resistance genes

S. aureus: For 11 *Staphylococcus aureus* strains and blood cultures, susceptibility results determined by the VITEK2 system, Etest strips and disk diffusion tests were compared with the results of the microarray hybridisation assay for the simultaneous detection of antibiotic resistance genes (Tab. 4). The presence or absence of resistance genes as indicated by microarray hybridisation was confirmed by PCR with gene specific primers (results not shown).

Tab. 4: Correlation between phenotypic and genotypic antibiotic resistance for 11 *S. aureus* isolates and blood cultures.

a) Penicillin resistance [a]	Hybridisation with *mecA/blaZ*	
	No. pos.	No. neg.
10 (resistant)	10	0
1 (susceptible)	0	1
b) Oxacillin resistance	Hybridisation with *mecA*	
	No. pos.	No. neg.
7 (resistant)	7	0
4 (susceptible)	0	4
c) Erythromycin resistance	Hybridisation with *ermA, ermC* or *msrA*	

	No. pos.	No. neg.
6 (resistant)	6	0
5 (susceptible)	0	5
d) Tobramycin resistance	Hybridisation with *aadD*	
	No. pos.	No. neg.
5 (resistant)	5	0
6 (susceptible)	0	6
e) Gentamicin resistance	Hybridisation with *aacA-aphD*	
	No. pos.	No. neg.
0 (resistant)	0	0
11 (susceptible)	0	11
f) Trimethoprim resistance	Hybridisation with *dfrA*	
	No. pos.	No. neg.
1 (resistant)	0	1[b]
10 (susceptible)	0	10

[a] Number of strains tested for resistance

[b] *dfrA* gene detected by PCR

For the *S. aureus* strains there was a 100% correlation between phenotypic resistance to penicillin and hybridisation to the *mecA* and/or *blaZ* gene (both genes confer resistance to penicillin, Tab. 4a). Phenotypic resistance to oxacillin correlated 100% with the hybridisation of the *mecA* gene (Table 4b), between resistance to erythromycin and hybridisation to the erythromycin resistance genes *ermA*, *ermC* or *msrSA* (Tab. 4c) and between resistance to tobramycin and hybridisation to the *aadD* gene (Tab. 4d). Furthermore, they all showed 100% correlation between phenotypic susceptibility to gentamicin and no hybridisation to the resistance genes *aacA-aphD* (Tab. 4e). Notably the *dfrA* gene of the trimethoprim resistant strain MW2 (MIC of 1 µg/ml) was not detected by microarray hybridisation (Tab. 4f), whereas PCR amplification revealed the presence of the *dfrA* gene.

<u>*E. coli* and other Gram negative bacteria:</u> The prototype microarray harboured only

four *E. coli* and one *P. aeruginosa* resistance gene probes which do not yet allow a comprehensive prediction of antibiotic resistances. Nevertheless, hybridisation with the *E. coli* resistance gene probe *blaTEM106* was observed in one *P. mirabilis* and four *E. coli* strains and correlated with phenotypic ampicillin resistance for all five strains (Tab. 5).

Tab. 5: Correlation between ampicillin/penicillin resistance, gentamicin/tobramycin resistance and streptomycin resistance and hybridisation with the resistance gene probes *blaTEM-106*, *aacC2*, *aph-A3* and *strB*, respectively.

Species	Resistance phenotype[a]	Hybridisation with			
		blaTEM-106[b]	*aacC2*[b]	*aph-A3*[c]	*strB*[b]
E. coli ATCC 25922	susceptible	-	-	-	-
E. coli C4821	AMP, STR	+	-	-	+
E. coli F3437	AMP	+	-	-	-
E. coli C3941	AMP, STR	+	-	-	+
E. coli F1806[d]	AMP, GEN, TOB, STR	+	+	+	+
E. coli C4547	AMPi	-	-	-	-
E. coli C4230	AMP	-	-	-	-
E. coli C3940	susceptible	-	-	-	-
E. coli F1642[d]	STR	-	-	-	+
P. mirabilis C4024	AMP, STR	+	-	-	+
P. mirabilis C4403	susceptible	-	-	-	-
P. mirabilis F1738 [d]	susceptible	-	-	-	-

[a] AMP, ampicillin; GEN, gentamicin; STR, streptomycin; TOB, tobramycin; i, intermediate
[b] *E. coli* gene probes
[c] *S. aureus* gene probes
[d] Positive blood culture

One *E. coli* blood culture showed also resistance to tobramycin and gentamicin. This phenotypic resistance correlated with the hybridisation of the *aacC2* gene probe for aminoglycoside resistance and the *S. aureus* *aph-A3* probe for tobramycin/kanamycin resistance (Tab. 5). For one *P. mirabilis* and four *E. coli* strains, phenotypic resistance to streptomycin correlated with hybridisation to the *strB* probe (Tab. 5).

All *P. aeruginosa* strains hybridised with the *mexA* gene probe (Fig. 1) and showed phenotypic resistance to tetracycline, trimethoprim/sulfamehoxazole, penicillins (ampicillin, mezlocillin) and cephalosporines (cefazolin, cefixime, cefuroxime). The *mexA-mexB-oprM* operon is a determinant for a three component efflux system responsible for intrinsic and acquired multiresistance in *P. aeruginosa* (ß-lactams, fluoroquinolones, trimethoprim, sulphonamides, chloramphenicol and others) (Poole, K., Clin. Microbiol. Infect. 10:12-26 (2004)).

Example 1.11: Microarray for specific detection of *S. aureus*

A) Strains and Cultures

Reference strains and clinical isolates: The following bacteria were purchased from the American Type Culture Collection (ATCC, Manassas, Va.) or the Deutsche Sammlung für Mikroorganismen und Zellkulturen (DMSZ, Braunschweig, Germany) and were used for evaluation of the specificity of the microarray: *Staphylococcus aureus* (ATCC 29213), *Staphylococcus epidermidis* (ATCC 12228; ATCC 18610) *Staphylococcus saprophyticus* (ATCC 14953), *Escherichia coli* (ATCC 25922), *Pseudomonas aeruginosa* (ATCC 27853). Ten clinical MRSA (methicillin resistant *S. aureus*) isolates were obtained from the inventors´ clinical routine microbiology laboratory.

Bacterial cultures: Bacterial strains and clinical isolates were plated either onto sheep blood or onto Mueller-Hinton agar from 50% glycerol stocks. One colony was then picked and transferred to 5 ml Luria-Bertani (LB) broth and cultured overnight at 37°C.

Blood cultures: Aerobic blood culture bottles (BACTEC® Plus aerobic, Becton Dickinson, Heidelberg, Germany) were inoculated with 100 CFU of *S. aureus* after adding 10 ml blood from healthy volunteers. A BACTEC® 9240 blood culture system (Becton Dickinson) - a continuous reading, automated, and computed system detecting the growth of microorganisms by monitoring CO_2 production – was used for incubation according to the manufacturer's recommendations. Bottles with a positive growth index were removed from the incubator, and an aliquot of 1 ml of the blood culture suspension was taken aseptically with a needle syringe. The aliquot was equally divided, with one part for subculture on agar plates and CFU determination, and one part for DNA isolation.

Additionally, in order to test the microarray upon real conditions, samples were collected from ten clinical positive blood culture specimens cultivated under the same conditions as described above. Six of them were positive for different *S. aureus* strains and four for other bacterial species (*Staphylococcus epidermidis*, *Streptococcus mitis*, *E. coli* and *Klebsiella oxytoca*). Blood culture aliquots of 500 µl were used for DNA preparation.

B) Generation of the *S. aureus* specific microarray

About 140 gene segments of *S. aureus* genes, but also a few of CoNS (SEQ ID NO: 177,178,179), were selected from the literature and nucleotide databases in order to cover different functional categories (virulence factors, species-specific metabolic and structural features, antibiotic resistance determinants). Tab. 6 provides the complete list of selected genes with gene symbol, gene function and SEQ ID NO of the segments.

Tab. 6: Selected *S. aureus* genes, selected segments (SEQ ID NO) and primers used for segment amplification (SEQ ID NO)

Gene symbol	Functions	gene probe SEQ ID NO	Primer forward [SEQ ID NO]	Primer reverse [SEQ ID NO]
atl	autolysin	99	AGCTGAGACGACACAAGATCAAA [1144]	TTATATTGCGTTTCAAGAGCTGC [1145]
aroA	3-phosphoshikimate 1-carboxyvinyl-transferase	84	ACCTTCAATATTCGCATCC [1114]	TATTCCGATTATTAGGCGTAG [1115]
aroC	Chorismatsynthase	83	ATGAGATACCTAACATCAGGAGAATCA [1112]	GCTATTCTTCCATCTAATTTACGATCATA [1113]
aroE	Shikimatdehydrogenase	95	GTTATCAATTAATACAACCCCTGAAGC [1136]	TGGAACTAATTCTCCTTCGATTGTTA [1137]
aroF	3-deoxy-D-arabino-heptulosonate-7-phosphate synthase	96	GTAGTTGAAAATATGCCTGTTGGTGT [1138]	ATTACACCATTAACGATAATTGGCAT [1139]
aroG	Chorismat-Mutase	97	AGACTTATTATCTAAACGTGGTGAACTAGC [1140]	CAAATGATTTATTGCCGTCTCCTA [1141]
asp23	alkaline shock protein	98	AAAATTGCTGGTATCGCTGCA [1142]	GTCATTACATCATCAACTTGCATGTTA [1143]
cata	catalase	1	TAAATTGTTTAGATTACAATCAGAGG [948]	TTCAAAGTTTTCGTATGTTTCA [949]

clpC	endopeptidase	7	AATGCTGCTAACCTG CGTGAT [960]	CACGTCTAACCGCTTTAC TGATTG [961]
clpP	endopeptidase	8	AAAGTAAAGAGTAGA CTAAGCTGTCTGCTC [962]	ACCTAATAAAATTCAAGC ATTGGGA [963]
ctaA	cytochrome biosynthesis	9	AAGAATTTAAAATGGT TAGGTGTCGTA [964]	ACGTAATCGTTTTGTTGC CAAATA [965]
ctsR	transcription repressor of class III stress genes homologue	10	AACGTCCCATGCCATT AATTTT [966]	TTGCGTTTCTATTTAGCTC AGACA [967]
dltA	D-alanine-D-alanyl carrier protein ligase	11	ACAGAGCAGCAAAAG CGTTAGTG [968]	GACCTTGAATGAACCATT GACCAT [969]
dltB	hypothethecal membrane transporter	12	CATATGGTGATTTTAC ATTCTTCTTAATTG [970]	CCTAACCATGTACTTTGT AACACTTTCA [971]
dltC	D-alanyl carrier protein	13	AAATTTATTAGCAGAA GTAGCAGAAAATG [972]	CTGAACTCTTCTAATGCTT CAACGATT [973]
dnaK	Heat-shock-protein	14	TTTAGGCGAAAATATT GGTGAAGA [974]	TTTGTCGTCGTCTTTTACT TCGTT [975]
elkT	lantibiotic epilancin K7 translocator	15	GGTCTTATCGTTGCA GCTATCACTAT [976]	GAGCGTATCGCATAAATA ATCTTTTC [977]
eno	2-phosphoglycerate dehydrogenase	87	CGATGTTCATCATTGG TACTGGTA [1120]	GGTGTTACTAAAGCAGTT GAAAACG [1121]
glnA	glutamine synthetase; belongs to the femC locus	17	TAGTCACCATGAAGTT GCCCC [980]	CCTCTTGAAGATGGTACA CGGAT [981]
glnR	glutamine synthetase repressor; belongs to the femC locus	18	CGAATGATGCAATCA GACGAAA [982]	CACCACGATTTATTGGCA AAGTT [983]
grlA	DNA topoisomerase IV subunit A	19	TTGAATCACCAAATTG AGGTTGT[984]	CAGTCGTTCAGATTTGAA TTTCTTT [985]
grlB	gyrase-like protein beta subunit B	20	AAATCCATCGAGATG GTAATATATATCA [986]	AAACTTAAAATACTTTCTG AATATTGATCAT [987]
groEL	stress response; heat shock protein	21	GTATGCAATTTGATCG TGGTTAT [988]	TGTTAATGCATCGCCTTC AAC[989]
groES	stress response; heat shock protein	22	ATGTATGTTAGCACTC TTTAATGTTAAGTG [990]	GTTTAGTTGTGTTTCATTT TCGTT [991]
gyrA	DNA gyrase subunit A	60	CATCATTAATTCGATT CCCTGAAT [1066]	TCATTTACTTCATCTGCAT CCTCTT [1067]
gyrB	DNA gyrase subunit B	61	TCAATTTGACTTAAAA GAAGTTGGC [1068]	AAGATTTGTGGCATATCC TGAGTTA [1069]
hemA	Glutamyl-transfer RNA reductase	23	TGTCATATTATCAACA TGTAATCGAACTG [992]	AATATCAGTAATTCCAGA ACCAAGAAGAT [993]
hemB	Porphobilinogene synthase	62	TTGATAGACATAGAA GATTGAGATCATCAG [1070]	ACTTGAGAAATTGCTGTT TTAACAAGTAG [1071]
hemC	Porphobilinogene deaminase	63	GTAAATTAGTCGTTG GCTCCAGAAG [1072]	GGGATAGTGGTGTATGTG TTTTAGAAATA [1073]

hemD	Uroporphyrinogene III synthase	64	TGTTGATAACATTGCTGTGATAGGAA [1074]	AATGCATCGATTTGTTGATGTTCTA [1075]
hemE	Uroporphyrinogene decarboxylase	24	AAAATGATCAAAGGTGAAGAAACATC [994]	AATCCTCGACATTTAATGCACCTAC [995]
hemH	Ferrochelatase	25	AATGGGATTATTAGTTATGGCTTATGG [996]	GTGGATATGGATCATTATTCTTTTCG [997]
hemL	GSA-1-Aminotransferase	26	ATGAGATATACGAAATCAGAAGAAGCA [998]	CTAATCTTAAAGTATCCAATGTAGCTTCTGTA [999]
hemN	oxygen-independent coproporphyrinogen oxidase	65	ACAGAATCAACCTGTAGATGAGTACTTAGAT [1076]	TGATATTCGTATAACGCACACCATC [1077]
hemY	putative involved in a late step of protoheme IX synthesis	27	AAACAGCAAGATCCTAATATTGATGTAAC [1000]	CTCTACGTACAATCGATACTAATTCATTATCT [1001]
lepA	GTP-binding protein	28	ATTAACAAAATTGATTTACCTGCTGC [1002]	CTATAACCAAAACCTAATGCTTGTGAC [1003]
lrgA	holin-like protein LrgA	29	AAAGACGCATCAAAACCAGCA [1004]	GGCTAATGACACCTAAAGAGTTAACAACT [1005]
lrgB	holin-like protein LrgA	30	GATTAACCACTTAGCACTAAACACACCT [1006]	AATGTTTAACAAGCACTTCACGCT [1007]
lytM	peptidoglycan hydrolase	31	CGACAAACACCCAACAAGCA [1008]	TGGCTGTTATACGCTTGGTTGT [1009]
menB	naphthoate synthase	32	GTTATCGTATTAACTGGTGAAGGTGATT [1010]	ACATTTAGTACATTACCGCCACCTAC [1011]
menC	o-succinylbenzoic acid synthetase	69	TTTAAGTCACAAATTGTAACACCGAA [1084]	TTAATTTAATTCTGGTCGGCTTTGT [1085]
menD	2-Succinyl-6-hydroxy-2,4-cyclohexadiene-1-carboxylase	33	CGTAAGGGAAGTAGTTATCAGTCCG [1012]	TTAGCTGTATACTCGAAATCCAATCC [1013]
menE	O-succinylbenzoic acid-CoA ligase	34	ATGGACTTTTGGTTATATAAACAAGCAC [1014]	TATTTCAGCAATGTCACCCGTATTA [1015]
menF	Isochorismate-Synthase	35	ATTGATAATTTACATCCAACACCTGC [1016]	TCACTATCTGGATCAGAATCTTTAACAAT [1017]
murC	UDP-N-acetylmuramoyl-L-alanine synthetase	70	CTTGGGGTGATGATGAACATCTA [1086]	AAGTGTGTGGTTGAAATACTGCAA [1087]
mutL	DNA mismatch repair protein	38	TCGTTTACATCATAATAATCATCAGAC [1022]	ACACAGAGAATAACCAGGAGAAGA [1023]
mutS	DNA mismatch repair protein	39	TTGTAATTCACTTAACTTCACCAATG [1024]	TCAAGTTGCGAAATTAGCTGA [1025]
pbg	porphobilinogen synthase	41	GGTGTTCCAAACTCAAAAGATGATATA [1028]	TTGACACCATAACTCATTATAGGAATATTG [1029]
pdhB	pyruvate dehydro-genase (lipoamide): subunit E1beta	43	TGACATTTCAAATCAATCACATCG [1032]	TTGGTAACCAAACATTTTCAGCTT [1033]

pdhC	dihydrolipoamide acetyltransferase: subunit E2	44	CTGGAGATACTATTG AAGAAGACGATG [1034]	TTGCTTTTACAGTTCTGTT TTCATCTAC [1035]
pdhD	dihydrolipoamide dehydrogenase: subunit E3	72	CAGGTAAATTAGTTGT AGTTGGTGGAG [1090]	AGTGGTAAACCTGGAACG ATATCA [1091]
rpoB	RNA polymerase B-subunit	73	ATTGTTACGTGCATTA GGTTTCTCA [1092]	TTTCTACTGGCTCGTCTAT AACGC [1093]
rsbU	putative operon encoding alternate sigma factor	45	TAGTTATCGAGATTAT CAAAGATTGGTAGA [1036]	GTAATTGTGAGTGTCCAT AAGAATCCA [1037]
rsbV	putative operon encoding alternate sigma factor	46	TGAATCTTAATATAGA AACAACCACTCAAG [1038]	ACGATCTGACACACCTAA AATGTA [1039]
rsbW	putative operon encoding alternate sigma factor	47	TCTAAAGAAGATTTTA TCGAAATG [1040]	CCCACATTGTTATTTTCTT TGTAT [1041]
sdrC	serine-aspartate repeat protein multigene family	139	GAAAGTATTCTGTAG GTACTGCTTC [1224]	CCTTTATCAATCGCAATG TC [1225]
sdrD	serine-aspartate repeat protein multigene family	140	CGGGCAAATAAATAA AGATG [1226]	AACTGAAGATAAGCCGTT TG [1227]
sdrE	serine-aspartate repeat protein multigene family	141	TCTGTCGCAGTTTTAT CAGTTGAAG [1228]	GCAAAACAAGATGATGCA ACG [1229]
sgp	G protein	48	TGAGATAGATGCAAT CATGTTTATGG [1042]	GAAATAGGTACAATCTCT GTAAAGTCCATATA [1043]
sigB	sigma factor B	78	GATGGTTCAACTGTTA CGCTATTA [1102]	CTCTGAAGTCGTGATACA TGCA [1103]
sirR	sit operon metal dependent repressor	49	AATATAATTGGGAAG AAGTACATCAAGAAG [1044]	ATATTAGCAAATCGGTCT TATCTCTCA [1045]
sodA	superoxide dismutase	50	TTGAATTACCAAAATT ACCATACG [1046]	CTCCCAGAATAATGAATG GTTTAAAT [1047]
sodB	superoxide dismutase	51	GCGCATTTTGAAAAG GCA [1048]	GGGATAGCACGTAAAAGT GGAA [1049]
srtA	tanspeptidase;sortase that anchors surface proteins to the cell wall	91	CTGGTCCTGGATATA CTGGTTCTTT [1128]	GATTAATGACAATCGCTG GTGTG [1129]
sstA	iron transport proteins	52	TTCGTTGTTCATAGGT GCGAGT [1050]	CTTTGAACAGCACTCGTG CG [1051]
sstB	iron transport protein	53	TATTGCCTTATTTAGA TGTATTGCTTTT [1052]	TCGTAGCTTCAAACACAT TTTCAA [1053]
sstC	iron transport protein	54	AATCAAATGATATTGG AAGATATTAGCA [1054]	TATTCAGTATCTTGTGCTA TTGTCATTG [1055]
sstD	iron transport protein	55	CATGCGGTAACAATT CTGATAAAGA [1056]	AATTTTCGCTTTAGGTGC AGCT [1057]

stpC	Potential ABC transporter	92	TTAACAATAGAACATT TAACAAAGAAG [1130]	CTCGAAATTAAGAAAGTA ACACC [1131]
tag	DNA-3-methyladenine glycosidase	81	GCATTTGGTACTAAA GATCCAGTCTACT [1108]	AACGAAAATACTGTTACT GGACCTAAAA [1109]
trx	thioredoxin reductase	56	GCTGACTATGAAGGT AAAGCTGACA [1058]	CAGCTAAGTTTTCTTTTG GTTGGA [1059]
tyrA	prephenate dehydrogenase	82	ATTCATTTAGTCAGTG GTCATCCAAT [1110]	GCTGTCGAATCATTTCTA AAATATACGT [1111]
yhiN	yhiN-protein	57	CAATTGGCTTTCGATT ATTGTTGTA [1060]	AACCAATGATCTAGTGTA AATGTTAAACCT [1061]
	Virulence Factors			
clfA	clumping factor A	3	GCTTCAGTGCTTGTA GGTACGTTAA [952]	TTGATTCACTAATTCCTCC GCAT [953]
clfB	clumping factor B	4	TAATGATACATCTGAT ATTAGTGCAAACAC [954]	TTTAGCATCAGCAGCATT TACTACC [955]
cna	collagen adhesin	85	TCGAGGAATTAACAA AGGTC [1116]	ATCAGGTTTAGTTGGTGG TG [1117]
coa	staphylocoagulase	5	TGTTAGGGATACACA ACATAAAACTGA [956]	GATTTTGTTTCAGATTCAC CGTATTT [957]
ebpS	cell surface elastin binding protein	86	GAACCTAGCCATCAA GACAG [1118]	GCATTATTAGAGGCATGT GG [1119]
EDIN	Epidermal cell differentiation inhibitor	113	TATCTTTAGCATTAAG CGTTTATTCAAT [1172]	TTTCTAACTAGATTTTCAT CATACTGGC [1173]
eta	exfoliative toxine A precursor	114	TGCATTTAATTTACCA AAAGAGCTT [1174]	TGGATAGCCTATTAATTC GAGTTTG [1175]
etb	exfoliative toxine B precursor	115	AAGAGCTTTATACACA CATTACGGATAA [1176]	CAAAATATTGAGAATCAT TGAACATTTC [1177]
fbpA	fibrinogen binding protein	88	CTCTTTTTACCTTTGA CGTTGGATT [1122]	GCCAAAATAGTGCTTCAA TATCAGA [1123]
fib	fibrinogen binding protein	89	GCTTTTCTGTGTGCAC TGACAGT [1124]	AGCGAAGGATACGGTCC AAG [1125]
fnbA	fibronectin-binding protein	93	TTACATCTGTACCCGT TTCCACTT [1132]	AAACTGCACAACCAGCAA ATATAGA [1133]
fnbB	fibronectin-binding protein	90	CCGCCTTAATTCCTTC TCCAAA [1126]	GCGAGTTGATTTGCCATC GG [1127]
geh	lipase precursor; glycerol ester hydrolase	59	GAACAAGGGAATGCG ATAACG [1064]	AGGTGCAGTTTTATCATT AGACGG [1065]
hla	alpha-hemolysin	120	ATGATGAAAATGAAA ACACGTATAGTC [1186]	ATTTGAGCTACTTCATTAT CAGGTAGTTG [1187]
hlb	beta-hemolysin	121	TGTTAATAAAGGCACT CCAGAGTTC [1188]	CTTTGATTGGGTAATGAT CTGAAAA [1189]
hld	delta-hemolysin	110	TTTTATCTTAATTAAG GAAGGAGTGATTTC [1166]	TAGTGAATTTGTTCACTG TGTCGATAA [1167]

hlgA_C	gamma-hemolysin component A; C-terminus	117	ACTGAAGTAGAAAGT CAGAACTCTAAAGGT [1180]	GTGTTTTCCAGTTCACTTC ATATTTAACT [1181]
hlgA_N	gamma-hemolysin component A; N-terminus	116	CTTAAAATTAAATAGA AAGAAAGT [1178]	ATGTTTTGAGTTATAGCT AATCGTT [1179]
hlgB	gamma-hemolysin component B	118	ATAGCTTCCACCCAAC ATATGGTAA [1182]	ATTTCACTTTGTGATTTTC CCAATC [1183]
hlgC_C	gamma-hemolysin component C; C-terminus	119	AATCAGCATTTGATAG CGATTTATTT [1184]	CCAATTGACTTCATATTTC ACAGTGTA [1185]
hysA	hyaluronate lyase	111	AAACATCAAATCGCT GTGGCT [1168]	GTGAAAGATGCCCTTGAG TGG [1169]
IgGbg	IgG-binding protein	112	GGGTTCTTGCTGTCTT TAAGTGATT [1170]	TATATCTCGAAGTTGCTA GTTGGGG [1171]
lip	lipase; glycerol ester hydrolase	68	TTTTAAGTGGTGGAC AAGCACAA [1082]	GATTGTTATTAGCGTTTG AATCTTGAC [1083]
lukF	leucocidin F	122	CATATGGCAGAGATA GTTATCATTCAACT [1190]	GATGTATGAGTTGCTCTT ATGTGATCTTTA [1191]
lukS_C	leucocidin S; C-terminus	124	AGTGTTCAATGGGGA ATAAAAGCTA [1194]	GATCCTTCTAAATAACTAT TGCCATAGTG [1195]
lukS_N	leucocidin S; C-terminus	123	AACATTGTCGTTAGG AATAATCACT [1192]	AATCAAAGCATCTTTGTTA TACTTT [1193]
NAG	N-acetyl-glucosaminidase; cytotoxin	125	ACTCAAACAGTTAGC AAGATTGCTC [1196]	TGCATTTACCCAACCAGT GC [1197]
nuc	nuclease	71	GCGATTGATGGTGAT ACGGTT [1088]	TTTTCGCTTGTGCTTCACT TTT [1089]
sak	staphylokinase	126	CGAGTTATTTTGAACC AACAGGC [1198]	GCGCAAAGATCGAAGTCA CTTAT [1199]
sea	staphylococcal enterotoxin A precursor	127	CTGATGTTTTTGATGG GAAGGTT [1200]	TGCATGTTTTCAGAGTTA ATCGTTT [1201]
seb	staphylococcal enterotoxin B precursor	128	ATATATTCTATTAAGG ACACTAAGTTAGGGA AT [1202]	AGTTAGGTAATCTAATTCT TGAGCAGTCA [1203]
sec	staphylococcal enterotoxin C precursor	129	GGCACATGATTTAATT TATAACATTAGTG [1204]	ATTCCTAGCTTTTATGTCT AGTTCTTGAG [1205]
spa	immunoglobulin G binding protein A precursor	94	GGTATTGCATCTGTAA CTTTAGG [1134]	AGGTTAGCACTTTGACTT GG [1135]
sprV8	V8 serine protease gene	137	ACAAACGCAGTCAAG CAAACA [1220]	CATTGTTGCTGGTTTAAC TACTTCAC [1221]
tst	toxic shock syndrom toxin	138	AAAATTACCTACTCCA ATAGAACTACCTTT [1222]	TTTCTGCTTCTATAGTTTT TATTTCATCA [1223]
	Antibiotic Resistance Determinants			
aacA-aphD	bifunctional aminoglycoside modifying enzyme	843	ACCCTCATAAAAATAA TCCAAGAGC [2632]	CTTTTTCTTTTGCATAACC TTTTTTC [2633]

aadD	aminoglycoside acetyl transferase; kanamycin resistance	837	AAGCAGAGTTCAGCC ATGAATG [2620]	CAGATGCGATGATGCAGA CC [2621]
aphA3	3' 5'-aminoglycoside acetyltransferase; kanamycin resistance	845	CTGGTGGGAGAAAAT GAAAACC [2636]	CCAGTTTTCGCAATCCAC ATC [2637]
blaI	regulator protein	814	AGCAAGTTGAAATAT CTATGGCTGA [2574]	TCATTTAAAATGTCTCGCA ATTCTT [2575]
blaR	beta lactamase repressor	790	GAAAATTCACGTATGT CATGGAATC [2526]	GCATTTTTCCCAGATGGC TT [2527]
blaZ	beta-lactamase	827	GATAAGAGATTTGCC TATGCTTCAA [2600]	TGCTTAATTTTCCATTTGC GAT [2601]
cadA	Probable cadmium-transporting ATPase (Cadmium efflux ATPase)	897	TTGGATAGTTCAACAA AAACATTAACA [2740]	CATTTTTATCTTCTGTTAC CACTGGTT [2741]
cadC	Cadmium efflux system accessory protein homolog	908	TAGCAACCTCCCTTTG ATAC [2762]	ACAAAAGATATGTGTGAA GTTACC [2763]
cat	chloramphenicol acetyltransferase	862	CCTTCTTTGATTTATG CAATTATGG [2670]	GAAGCATGGTAACCATCA CATACA [2671]
dfrA	S1 dihydrofolate reductase; trimethoprim resistance	859	ATGACATTATCAATAA TTGTCGCTCA [2664]	AACATGACCAGATAACTC TTTAATTTCAT [2665]
ermA	rRNA methylase	852	TAGCTATCTTATCGTT GAGAAGGGAT [2650]	AAAGAAATTGTTCCTTCG ATAGTTTATT [2651]
ermB	adenine methylase	851	AACCGATACCGTTTAC GAAATTG [2648]	CGCTTGTAGAATCCTTCT TCAACA [2649]
ermC	adenine methylase	846	AACACAGTCAAAACTT TATTACTTCAAAAC [2638]	TTGCATAATTTATGGTCTA TTTCAATG [2639]
femA	factor essential for methicillin resistance	801	TAGGATTTGAACATAC TGGATTCCA [2548]	AAAGGCACTAACACACGG TCTTT [2549]
femD	putative factor essential for methicillin resistance	16	TCAGGTGAAATGTTA GAATCAGCA [978]	TAAGTCACCAAATAAGAA TGGCG [979]
fmhA	similar to Staphylococcus aureus FemA and FemB proteins	825	GTTAACGATTGATGA AACGCAAA [2596]	TGCACCATCTTGTTCAATT TGTT [2597]
fmhB	essential for addition of glycine 1 to peptidoglycan precursor	818	GAGTTATTAAATAGTT TTGAACGCCG [2582]	TTCAGGATGTTCCTTTTCT AAAGCT [2583]
linA	lincosaminide nucleotidyltrans-ferase	850	GATATAGGATACAAA ATAGAAGTTGATTGG [2646]	GGTCTTTTTCTGTTAATTC ATAACCG [2647]

mecA	penicillin binding protein 2'	802	ATATGAGATAGGCAT CGTTCCAAA [2550]	CTAATAGATGTGAAGTCG CTTTTCCT [2551]
mecI	mecI protein	812	TAATAAAACGTATGAA ATATCATCTGCA [2570]	TTTCATCTTGTGATAGATC TTCTTTTTC [2571]
mecR	mecI protein	798	TTTAAAGAATGGAAC CAAGATCAAA [2542]	TCGCCTTTTAAATGTGTA GCAAA [2543]
mreA	ABC transporter	907	GCAGTATTAGTACTTG ATGAACCAACG [2760]	GACAAAACGTACAGGATG TCCATAA [2761]
mreB	ABC transporter	36	ATGAGGTACTCTTTAA TTAGTGGTATCTTGA [1018]	ATCAGCTAATGAAATGAA GATTGCA [1019]
mreR	ABC transporter	37	GAAAATACAGAACTT GATGGTGAAATG [1020]	GCAAGACTCACATACACC ATAAACTTC [1021]
msrA	methionine sulfoxide reductase	854	TCATAAGCTGACAGA TTTTCGATCC [2654]	CTTTTAGATGAACCTACA AATCACTTGG [2655]
norA	quinolone resistance protein	904	TTAGCTTTCATAATGT CAGTTGTATTGA [2754]	ACAGTGTTTCAAATGCCG ATAAA [2755]
pbpF	penicillin-binding protein Pbp2b	42	AACACAATCGGAAAT GTTGGATAC [1030]	CTATCCCAATCCATAGAC GTGTTAA [1031]
qacA	quaternary ammo-nium compound resistance protein	885	CAATGGTTACAGGTT GTGGAAGA [2716]	GCCCACTACAGATTCTTC AGCTAC [2717]
spc	adenyltransferase AAD9	844	ATATCAGGAAAGATT GGAAATACGG [2634]	AAAGAGGTATAGCCCATT CTGCA [2635]

In order to obtain a high specificity level, each selected gene was compared to all other gene sequences available in the NCBI database using the BLAST algorithm. From that comparison, regions (ranging from 104 to 1434 bp) devoid of apparent homology with genes of other bacterial species and *Homo sapiens* were defined and amplified by PCR using specifically designed primers (see Tab. 6). A mixture of the total DNA from three different *S. aureus* reference strains and 100 clinical isolates was used as template for amplification of *S. aureus* gene segments, increasing therefore the chances to amplify more seldom occurring virulence and antibiotic resistance genes. PCR products were cloned into the plasmid pCR 2.1-Topo Vector (Invitrogen, Karlruhe, Germany) which were used to transform competent *Escherichia coli* (XL-1-Blue) cells using the Calcium Chloride protocol (Seidman, C.E. et al., in: Ausubel, F.M. (ed.), Current Protocols in Molecular Biology, John Wiley & Sons, Inc. (2000)). Recombinant plasmids containing selected gene segments were screened by restriction analysis and verified by sequencing. The plasmid library constructed was used for re-amplification and production of the bulk DNA (10 µg at a concentration of 1 µM) from each clone necessary for printing the microchips. A Microgrid II spotter (BioRobotics, Cambridge, UK) and CMT-GAPS™ coated glass slides (Corning Incorporated, Corning, USA) were used. The complete array of 140 segments of genes was spotted in 3 replicates per slide.

C) DNA purification

a) Sample preparation

Bacterial cultures: Overnight cultures (5 ml) were harvested at 2,560g for 10 minutes. After discarding the supernatant the pellet was washed in 1ml TE (10 mM Tris-HCl, pH 7.5 - 1 mM EDTA) and recovered by centrifugation at 17,900 g for 2 min.

Blood cultures: One ml of blood culture was mixed with 1 ml 0.1% Triton®-X-100 and kept at room temperature for 5 min in order to disrupt blood human cells and resolve bacterial clumps. Bacterial cells were then harvested at 17,900 g for 10 min. Pellets were washed in 1 ml TE and recovered as described above.

b) Purification of DNA

Pellets of harvested cells were resuspended in 500 µl lysis buffer (20 mM Tris-HCl, pH 8.0 - 2 mM EDTA, pH 8.0 – 1.2% Triton®-X-100). To promote bacterial lysis, lysozyme and lysostaphin (Sigma, Taufkirchen, Germany) were added to reach a final concentration of 0.8 mg/ml and 0.2 mg/ml respectively. To lyse Gram negative bacterial cells, only lysozyme in the indicated concentration was used. Samples were then incubated for one hour at 37°C. After treatment with Proteinase K (1 mg/ml) (Sigma, Taufkirchen, Germany) for 5 hours at 55°C under mild agitation, the samples were heated at 65°C for 30 min to inactivate Proteinase K and then cooled down to 37°C. Finally, a RNAse A treatment (0.2 mg/ml) was carried out for 1 hour at 37°C. A pre-treatment with CTAB (Cethyltrimethylammonium bromide) was performed in order to release DNA from polysaccharide DNA complexes (Murray, M.G. and Thopson, W.F., Nucl. Acid Res. 8:4321-4325 (1980)). Salt concentration was adjusted to 0.7 M by adding 5 M NaCl. After thoroughly mixing, a 10% CTAB-0.7M NaCl solution was added to adjust the CTAB concentration to 1%.

The mixture was subsequently incubated under rotation for 20 min at 65°C and then extracted with one volume of chloroform/isoamyl alcohol (24:1). The samples were spun in a microcentrifuge (17,900 g) at room temperature. The aqueous phase was extracted once with chloroform/isoamyl alcohol (24:1), once with phenol/chloroform/isoamyl alcohol (25:24:1) and finally with chloroform/isoamyl alcohol (25:24:1). Genomic DNA in the aqueous phase was sonified (3 x 10 s at 12% amplitude with 20 s breaks between pulses) in a Digital Sonifier (Branson, Schwaebisch Gmuend, Germany) to obtain fragments of around 1 kb, then precipitated with one volume of isopropanol and pelleted by centrifugation for 30 min at 4°C in a microcentrifuge at 17,900 g. The pellets were washed in 70% ethanol and resuspended in 50-100 µl TE (10 mM Tris-HCl, pH 7.5 - 1 mM EDTA). This DNA preparation was used when a high yield (hundreds of µg) was necessary, for example to prepare samples for several hybridisations experiments.

A second protocol using DNeasy Tissue Kit (QIAGEN, Hilden, Germany) adapted to bacterial cells and allowing DNA preparation in two hours, was also used when fast preparation was the priority. The abbreviations below pertain to the manufacturer's abbreviations for buffers used in the kit. The bacterial pellet was resuspended in 1 ml ddH_2O and the cell suspension frozen in liquid N_2 for 1 minute and then placed in a 60° C thermo-block for 2 minutes. Such a treatment was repeated once and bacteria were centrifuged again for 5 minutes at 14,000g. The resulting pellet was resuspended in 180 µl lysis buffer (20 mM Tris-HCl, pH 8.0 - 2 mM EDTA, pH 8.0 – 1.2% Triton-X-100). Specifically for *S. aureus* DNA preparation, lysostaphin (0.2mg/ml) was added and incubated 1 hour at 37°C. After, 200 µl of buffer AL (for gram positive bacteria) or buffer ATL (for gram negative) and 25 µl of the Proteinase K solution delivered with the kit were added and incubated at 70°C for 30 minutes. 200 µl of 100% ethanol were added and the suspension transferred to a DNeasy Mini Column placed into a collection tube. The column was centrifuged at 6,000 g for 1 minute, washed first with 500 µl of buffer AW1, centrifuged at 6,000 g for 1 minute, washed then with 500 µl of buffer AW2, and centrifuged at 14,000 g for 3 minutes. The column was then placed in a 1.5 ml tube and centrifuged once more at 14,000 g for 1 minute. DNA was eluted with 130 µl of buffer AE. After one minute the column was centrifuged at 6,000g for 1 minute. The eluate was reloaded in the column and centrifuged again under the same conditions in order to increase the DNA yield.

D) DNA labelling

Different amounts of DNA (5 ng to 5 µg) were labelled with 3 µl either of Cy5-dCTP or Cy3-dCTP (Amersham Pharmacia Biotech Europe, Freiburg, Germany) by random priming (1 x random primer/Klenow reaction buffer) using Klenow Polymerase (50units) (both from BioPrime DNA labelling Kit, Invitrogen, Karlsruhe, Germany) in the presence of 0.12 mM dATP's, dGTP's and dTTP's and 0.06 mM dCTP's, in a total volume of 50 µl. After 2 hours incubation at 37°C, the reaction was interrupted by adding 5 µl of 0.5 M EDTA and the probe purified either by MiniElute PCR or QIAquick Purification Kits (QIAGEN, Hilden, Germany), depending on the amount of labelled DNA applying two wash and two elution steps.

E) Hybridisation and detection procedure

All experiments described in the present example represent co-hybridisation of two different DNA samples labelled respectively with Cy3 and Cy5. Cy3 and Cy5 belong to the cyanine family of fluorophores and were used as reporter molecules. The photochemical properties of the two CyDye fluors were as follows: Absorption maximum at 550 nm and emission maximum at 570 nm for Cy3 and for Cy5 at 649 nm and 670 nm, respectively.

After purification, Cy3 and Cy5 labelled DNA were pooled and 10 µg of Salmon Sperm DNA and 50 µg of polyA DNA were added. The mixture was frozen in liquid nitrogen and lyophilized in the dark. DNA microchips were automatically hybridised in a GeneTac Hybridisation Station (Genomic Solutions, Harvard, USA) following the Corning protocol.

Shortly, 110 µl of pre-hybridisation buffer (25% Formamide, 5x SSC, 0.1% SDS, 10 mg/ml BSA) were added to each slide and incubated for one hour at 42°C. Lyophilized samples were resuspended in 110µl of hybridisation buffer (25% Formamide, 5x SSC, 0.1% SDS), denatured for 3 minutes at 90°C, added to the slides, and incubated 4 hours at 42°C. After several washing steps using successively 2 x SSC/0.1% SDS, 0.1 x SSC/0.1% SDS, and 0.1 x SSC, slides were dried by a 2 min centrifugation step (1000 g) and read in a Scan Array 5000 (Perkin Elmer, Boston, USA) using emission filters for Cy3 and Cy5 in two separate channels. Fluorescence intensities as hybridisation indicators were then analyzed by the software ImaGene (BioBiscovery, Marina Del Rey, USA). Spots were found and segmented in order to select areas of recognizable signals for analysis. Intensity of fluorescence of each spot was measured, signal to local background ratios were calculated, spot morphology and deviation from expected spot position were considered. Cut off values for those parameters were empirically determined in pilot experiments and used to tag spots either as positive or as negative.

F) Validation of the detection system

The experimental approach adopted in present example required dual-dye hybridisations. It was therefore necessary to verify at first whether DNA samples from the same source, labelled with one or the other fluorochrome, would produce the same hybridisation pattern. Co-hybridisation experiments, combining two identical samples of 2 µg of *S. aureus* DNA, produced strictly similar hybridisation results whatever fluorochrome was used for labelling (Fig. 2A). For better presentation gray scale images from scanning were converted in false-colour, where green and red colour represent intensity of Cy3 and Cy5 fluorochromes respectively. All spots showed double-hybridisation - yellow colour meaning the overlay between green (here assigned to Cy3 labelled DNA) and red signals (Cy5 labelled DNA). Signal intensities from both channels strongly correlated (r^2=0,97) (Fig. 2B).

G) Sensitivity of detection

S. aureus DNA samples in decreasing amounts (from 2 µg to 5 ng) were labelled and hybridised in order to determine the minimum amount of DNA producing the expected hybridisation pattern for a certain strain. Such expected patterns were defined as those produced by the hybridisation of 2 µg of DNA. From 2 µg to 50 ng no significant differences in the hybridisation pattern were observed with no false negative spots. Detection of 20 ng DNA was still satisfying with only 5% of false negative and false positive. However, 5 ng of labelled DNA yielded weak signals with almost 95% of false negative spots (data not shown). The limit of sensitivity of the *S. aureus* microarray was then considered as being 20 ng DNA which corresponds approximately to 7 x 10^6 *S. aureus* CFU (*S. aureus* genome 2.5 x 10^6 bp. 2.8 fg DNA per cell).

H) Specificity of detection

The specificity of the *S. aureus* microchip was demonstrated by six independently performed co-hybridisation experiments. Visual examination of pictures showing results of co-hybridisation of *S. aureus* DNA with *Pseudomonas aeruginosa* or *Escherichia coli* DNA revealed no cross-hybridisation between *S. aureus* selected gene segments and DNA probes from those Gram negative bacteria (data not shown). Transcribing these data in a bar code showing positive or negative spots (Fig. 3A and B) confirmed that only the *S. aureus* DNA sample hybridised with spotted probes.

The specificity of the microarray could be demonstrated even below the genus level. As shown in Fig. 4, some spotted *S. aureus* probes cross-hybridised with *S. epidermidis* and *S. saprophyticus* DNA samples. This is not surprising as these species are phylogenetically closely related. However, genes coding for *S. aureus* specific proteins as nuclease (*nuc*), clumping factors A and B (*clfA* and *B*), protein A (*spa*), V8 serine protease (*sprV8*) and alpha and beta hemolysins (*hla* and *hlb*) exclusively hybridised with *S. aureus* DNA. The presence/absence of such genes allowed unambiguous discrimination between *S. aureus* and CoNS.

I) *S. aureus* strain profiling

The principle of the *S. aureus* microarray was tested as a tool for strain profiling. A distinctive hybridisation pattern could be established for reference strains and 10 selected clinical isolates. For instance when DNA from clinical isolates T100 and T103 were labelled with Cy5 and Cy3, respectively, and co-hybridised, both isolates were identified as *S. aureus,* since both contained species-specific genes as e.g. clumping factor A and B (Fig. 5A).

Moreover, both strains are methicillin resistant (*mecA* positive), but only T100 contained the beta-lactamase gene. The hybridisation of T103 DNA reveals the presence of *ermA*, *ermB* and *aacA* genes indicating that the strain is resistant to erythromycin and aminoglycosides.

Apparently, T103 harbors the genes encoding enterotoxines A (*eta*) and B (*etb*) while in T100 the gene encoding enterotoxin C (*etc*) is present. The presence or absence of these genes was confirmed by PCR assays (Fig. 5B) and the antibiotic resistance was verified by classical antibiograms (Sahm, D. & Washington, J. A. (1991). Antibacterial susceptibility tests: dilution methods. In: Manual of Clinical Microbiology (Balows, A., Ed.), pp. 1105-16. American Society for Microbiology, Washington DC, USA) (data not shown).

<u>J) Detection of *S. aureus* in spiked positive BACTEC® cultures</u>

One possible application of the *S. aureus* microarray is to detect the bacterium growing in blood culture, i.e. after the BACTEC® signals bacterial growth. Blood culture bottles were spiked with 100 CFU of *S. aureus*. After the automated culturing system indicated bacterial growth, 1 ml was withdrawn for DNA extraction.

As shown in Fig. 6A, DNA samples prepared from sterile blood culture show no crosshybridisation with spotted *S. aureus* probes. A 2 µg DNA sample derived from blood culture containing *S. aureus* cells revealed a hybridisation pattern almost completely identical to a DNA sample isolated from an overnight LB culture inoculated with a *S. aureus* colony (Fig. 6B).

These data underscore the high sensitivity and specificity of the detection system since blood culture DNA comprises a mixture of human and bacterial DNA. Co-hybridisation between DNA from blood culture positive for *S. aureus* and CoNS DNA also allowed clear identification since only the *S. aureus* probe hybridised to *S. aureus* species-specific genes (data not shown).

<u>K) Detection of *S. aureus* in positive BACTEC® cultures inoculated with clinical specimens</u>

Co-hybridisation with DNA from clinical blood cultures positive for *S.aureus* and CoNS (*Staphylococus epidermidis*), *Streptococcus mitis*, *E. coli* and *Klebsiella oxytoca* allowed clear species identification since the *S.aureus* probes hybridised to *S.aureus* species-specific genes only. *Staphylococcus epidermidis* positive blood culture DNA hybridised to staphylococcal metabolic genes and to some antibiotic resistance determinant genes only. No cross-hybridisation was detected between DNA from the two gram-negative strains and the *Streptococcus* strain and *S. aureus* spotted gene probes (data not shown).

Example 2.1: Materials and Methods

Reference strains, clinical isolates and culture conditions: Bacterial reference strains were obtained from the American Type Culture Collection (ATCC, Manassas, Va.), the Deutsche Sammlung von Mikroorganismen und Zellkulturen (DSMZ, Braunschweig, Germany), the Collection Institute Pasteur (CIP, Paris, France) or the network on antimicrobial resistance in *Staphylococcus aureus* (NARSA, Herndon, Virginia). *Klebsiella pneumoniae* serotype O3 and serotype O8 were provided by E.M. Nielsen (Department of Bacteriology, Mycology and Parasitology, Statens Serum Institut, Copenhagen, Denmark). Clinical isolates were obtained from the inventors´ clinical routine microbiology laboratory.

The following bacteria and fungi were used for evaluation of the specificity of the microarray: *Acinetobacter baumannii* (DSM 30008, 1 clinical isolate), *Pseudomonas aeruginosa* (ATCC27853), *Escherichia coli* (ATCC 25922, CIP 105893, 81.88, 74.14 and 3 clinical isolates), *Klebsiella oxytoca* (DSM 4798, 1 clinical isolate), *Klebsiella pneumoniae* (DSM 681, serotype O3 strain 390 and serotype O8 strain 889), *Proteus mirabilis* (DSM 788, 2 clinical isolates), *Proteus vulgaris* (DSM 2140), *Candida albicans* (ATCC 10231), *Enterococcus casseliflavus* (clinical isolate), *Enterococcus faecalis* (ATCC 29212, 1 clinical isolate), *Enterococcus faecium* (clinical isolate), *Enterococcus gallinarum* (clinical isolate), *Streptococcus agalactiae* (DSM 2134), *Streptococcus angiosus* (DSM 20563), *Streptococcus bovis* (DSM 20480), *Streptococcus dysgalactiae* (DSM 20662), *Streptococcus gordonii* (DSM 6777), *Streptococcus mutans* (DSM 20523), *Streptococcus pneumoniae* (ATCC 49619), *Streptococcus pyogenes* (DSM 11723), *Staphylococcus aureus* (ATCC 29213, NRS123 alias MW2, 2 clinical isolates), *Staphylococcus epidermidis* (ATCC 12228, 1 clinical isolates), *Staphylococcus haemolyticus* (DSM 20263), *Staphylococcus hominis* (DSM 20228), *Staphylococcus lugdunensis* (DSM 4804), *Staphylococcus saprophyticus* (ATCC 14953) and *Staphylococcus warneri* (DSM 20316).

Bacterial and fungal reference strains and clinical isolates were grown over night at 37 °C with constant shaking in 5 ml Luria-Bertani (LB) broth or tryptic soy broth

(TSB, 30 g/l, Merck) containing 3 g/l yeast extract. Enterococci and streptococci were grown in 10 ml TSB plus yeast without agitation under 5% CO_2. Overnight cultures were harvested at 2,560 g for 10 min. After discarding the supernatant the pellet was washed in 1 ml TE (10 mM Tris-HCl, pH 7.5 and 1 mM EDTA) and recovered by centrifugation at 17,900 g for 10 min. Cell pellets were used for DNA preparation.

Example 2.2: DNA preparation

For microarray hybridization experiments, DNA was prepared from the strains listed in Example 2.1.

Total cellular DNA was extracted and purified by using the Bacterial Genomic DNS Purification Kit (Edge BioSystems, Gaithersburg, USA). Cell pellets were resuspended in 200 µl lysis buffer (20 mM Tris-HCl, pH 7.5, 50 mM NaCl and 10 mM EDTA, pH 8.0) and lysozyme (Sigma, Taufkirchen, Germany) was added to reach a final concentration of 7.5 mg/ml. In additon, lysostaphin (Sigma) was added to a final concentration of 0.2 mg/ml to promote Staphylococcal lysis or mutanolysin (0.5 U/µl; Sigma) was added to lyse Streptococci and Enterococci. After incubation at 37°C for one hour, 400 µl Sphaeroblast buffer were added and DNA was extracted following the instructions of the supplier.

Candida albicans DNA was extracted using the MasterPure Yeast DNA purification kit (Epicentre Biotechnologies, Madison USA) following the instructions of the manufacturer.

Concentration, purity and size of the purified DNA-preparations were determined by UV-spectrophotometry (lambda 40, PerkinElmer, Boston USA) and 1% agarose gel electrophoresis.

Example 2.3: DNA labelling

Prior to labelling, high molecular weight DNA (≥12 kb) was fragmented by sonication for 30 sec at an amplitude of 80% (energy input 1500 kJ) using an ultrasonic homogenizer (Sonoplus HD 3080, Bandelin, Berlin, Germany) equipped with a BR30 booster cup for high-intensive irradiation of small and sensitive sample volumes. The size of the fragmented DNA (500-8000 bp) was checked by 1.5% agarose gel electrophoresis. Different amounts of DNA (1 to 5 µg) were then labeled with 3 µl either of Cy5-dCTP or Cy3-dCTP (Amersham Pharmacia Biotech

Europe, Freiburg, Germany) by random priming (1 x random primer/Klenow reaction buffer) using Klenow Polymerase (50 units) (both from BioPrime DNA labeling Kit, Invitrogen, Karlsruhe, Germany) in the presence of 0.12 mM dATP's, dGTP's and dTTP's and 0.06 mM dCTP's, in a total volume of 50 µl. Prior to labelling, each target DNA was spiked with three gene segments (1 µl each, 30 ng/µl) amplified by PCR from selected recombinant plasmids to serve as internal positive controls. After 2 hours incubation at 37°C, the reaction was interrupted by adding 5 µl of 0.5 M EDTA and unbound label was removed using the QIAquick Purification Kit (QIAGEN, Hilden, Germany). The purified labelled DNA was eluted in 80 µl TE and the relative labelling efficiency of a reaction was evaluated by calculating the approximate ratio of bases to dye molecules (acceptable labelling ratios for nucleic acid were ≤60). This ratio and the amount of recovered labelled DNA was determined by measuring the absorbance of the nucleic acids at 260 nm and the absorbance of the dye at its absorbance maximum using a lambda40 UV-spectrophotometer (PerkinElmer) and plastic disposable cuvettes for the range from 220 nm to 1,600 nm (UVette; Eppendorf, Hamburg, Germany).

Example 2.4: Microarray construction

Cloned PCR-products were used to generate probes for the DNA microarray. All together 930 gene segments ("probes") were represented on the microarray (Tab. 7). They comprised probes for virulence genes, species specific metabolic and structural genes from *Candida albicans* (86), *Acinetobacter baumannii* (21), *Enterobacter cloacae* (11), *Escherichia coli* (31), *Enterococcus faecalis* (69), *E. faecium* (23), *Klebsiella oxytoca* (21), *K. pneumoniae* (50), *P. aeruginosa* (53), *Proteus mirabilis* (70), *P. vulgaris* (9), *Stenotrophomonas maltophilia* (13), *Streptococcus agalactiae* (38), *S. dysgalactiae* (1), *S. pneumoniae* (83), *S. pyogenes* (42), *S. viridans* (19, including probes for *S. mutans* and *S. bovis*), Streptococci (2), *Staphylococcus aureus* (69), *S. epidermidis* (35), *S. haemolyticus* (7), *S. hominis* (1), *S. lugdunensis* (6), *S. saprophyticus* (2) and *S. warneri* (7), as well as for bacterial antibiotic resistant determinants (131), and positive and negative controls (29).

Tab. 7: Gene probes on array of example 2.

n	Probe Name	SeqID

n	Probe Name	SeqID
1	16SKpn_1_1	934
2	16SrRNAPrmi_1_1	940
3	16SRNAEf_1_1	936
4	16SRNAEf_2_1	933
5	16SShaemolyt_1_1	938
6	16SShominis_1_1	937
7	16SStrepagalactiae_1_1	930
8	16SPa_1_1	926
9	16SSa_1_1	942
10	16SSa_3_1	935
11	16SStrepneu_1_1	929
12	16SStrepyog_1_1	928
13	16SKlox_1_1	943
14	16SrRNAPrvu1_1_1	941
15	16SEfaecium_1_1	931
16	16SEfaecium_2_1	932
17	23SEfaecium_1_1	939
18	23SEfaecium_2_1	927
19	ARHGDIA(hu)_1_1	923
20	b-Act(hu)_1_1	922
21	GAPD(hu)_1_1	921
22	LDHA(hu)_1_1	920
23	PGK1(hu)_1_1	924
24	rbcL_1_1	919
25	rbcL_1_2	925
26	aac(6p)-Ib7_1_1	2867
27	aacA-aphD_1_1	843
28	aacA4ENCL_1_1	2864
29	aacC2_1_1	833
30	aadB_1_2	836
31	aadD_1_1	837
32	adeA-ACIBA_1_1	2866
33	adeB-ACIBA_1_1	2868
34	adeC-ACIBA_1_1	2869
35	AdeR-ACIBA_1_1	2865
36	AdeS-ACIBA_1_1	2870
37	aph-A3_1_1	840
38	strA_1_1	839
39	strB_1_1	834
40	aacA_aphDStwar_1_1	831
41	aacA4_1_1	842
42	aacA4_1_2	838
43	aacC1_1_1	841
44	aacC1_1_2	832
45	aadA_1_1	835
46	aphA3_1_1	845

n	Probe Name	SeqID
47	ampC-ENCL_1_1	2874
48	ampC_1_1	789
49	ampR_1_1	2873
50	blaA_1_1	823
51	blaB_1_1	788
52	blaIShaemolyt_1_1	803
53	blaL1_1_1	2875
54	blaL2_1_1	2871
55	blaMIR-3_1_1	2872
56	blaOXA-1_1_1	828
57	blaOXY-KLOX_1_1	816
58	blaSHV-1_1_1	794
59	blaTEM-106_1_1	815
60	blavim_1_1	804
61	blaZ_1_1	827
62	cumA_1_1	819
63	femA_1_1	801
64	femBShaemolyt_1_1	820
65	fmhA_1_1	825
66	fmhB_1_1	818
67	ftsWEF_1_1	817
68	mecA_1_1	802
69	meclSepid_1_1	786
70	pbp1a_1_1	813
71	pbp2aStrpneu_1_1	793
72	pbp2x_1_1	807
73	pbp3Saureuc_1_1	808
74	pbp4_1_1	809
75	pbp5Efaecium_1_1	810
76	pbpC_1_1	811
77	psrb_1_1	824
78	bla-CTX-M-22_1_1	792
79	bla_FOX-3_1_1	822
80	blaIMP-7_1_1	785
81	blaIMP-7_1_2	797
82	blaOXA-10_1_2	787
83	blaOXA-2_1_1	795
84	blaOXA-32_1_1	791
85	blaOXY_1_1	799
86	blaPER-1_1_1	821
87	blaPrmi_1_1	830
88	blaRShaemolyt_1_1	796
89	dacCStrpyog_1_1	800
90	fox-6_1_1	829
91	mecR1Sepid_1_1	826
92	pbp2b_1_1	805

n	Probe Name	SeqID
93	pbp2primeSepid_1_1	806
94	cat_1_1	862
95	catEfaecium_1_1	861
96	cmlA5_1_1	860
97	ble_1_1	875
98	ddl_1_1	874
99	vanRB2_1_1	870
100	vanSB2_1_1	872
101	vanWB2_1_1	873
102	vanXB2_1_1	876
103	vanA_1_1	867
104	vanB_1_1	879
105	vanC-2_1_1	881
106	vanH(tn)_1_1	866
107	vanHB2_1_1	868
108	vanR_1_1	869
109	vanS(tn)_1_1	871
110	vanX(tn)_1_1	882
111	vanY(tn)_1_1	877
112	vanYB2_1_1	878
113	vanZ(tn)_1_1	880
114	ermA_1_1	852
115	ermB_1_2	851
116	ermC_1_1	846
117	linB_1_1	847
118	mdrSA_1_1	849
119	mefA_1_1	856
120	mphBM_1_1	855
121	mrx_1_1	857
122	msrA_1_1	854
123	satA_1_1	853
124	satSA_1_1	848
125	abcXStrpmut_1_1	894
126	acrA_1_1	892
127	acrB_1_1	883
128	acrR_1_1	890
129	albA_1_1	898
130	arr2_1_1	906
131	cadBStalugd_1_1	888
132	elkT-abcA_1_1	896
133	emeA_1_1	891
134	mexA_1_1	889
135	mexB_1_2	884
136	mexR_1_1	905
137	mreA_1_1	907
138	norA23_1_1	904

n	Probe Name	SeqID
139	nov_1_1	901
140	qacEdelta1_1_1	895
141	rtn_1_1	893
142	sul_1_1	887
143	sulI_1_1	886
144	sulII_1_1	2888
145	wbbl_1_1	903
146	wzm_1_1	899
147	wzt_1_1	902
148	msrCb_1_1	900
149	uvrA_1_1	909
150	tetA-ACIBA_1_1	2907
151	tetAJ_1_1	863
152	tetL_1_1	864
153	tetM_1_1	865
154	tetR-ACIBA_1_1	2908
155	dfrA_1_1	859
156	dfrStrpneu_1_1	858
157	AAF1_1_1	247
158	ALS1_1_1	249
159	ALS7_1_1	250
160	ASL43f_1_1	232
161	BGL2_1_1	233
162	CACHS3_1_1	234
163	CEF3_1_1	237
164	CHS1_1_1	238
165	CHS2_1_1	239
166	CHS4_1_1	240
167	CHS5_1_1	241
168	CHT1_1_1	242
169	CHT2_1_1	243
170	CHT4_1_1	244
171	CSA1_1_1	245
172	GSC1_1_1	257
173	GSL1_1_1	258
174	HWP1_2_1	261
175	HYR1_1_1	262
176	INT1a_1_1	263
177	KRE15f_1_1	264
178	KRE6_1_1	265
179	KRE9_1_1	266
180	MP65_1_1	269
181	PHR1_1_1	272
182	PHR2_1_1	273
183	PHR3_1_1	274
184	PRA1_1_1	275

n	Probe Name	SeqID
185	RBT1_1_1	277
186	RBT4_1_1	278
187	RHO1_1_1	279
188	RVS167_1_1	283
189	SKN1_1_1	285
190	TCA1_1_1	287
191	YAE1_1_1	289
192	CDR1_1_1	911
193	CDR1_2_1	912
194	CRD2_1_1	910
195	ERG11_1_1	917
196	FET3_1_1	914
197	FTR2_1_1	915
198	MDR1-7_1_1	916
199	MET3_1_1	913
200	SEC20_1_1	918
201	ADH1_1_1	248
202	ARG56_1_1	231
203	ESS1_1_1	253
204	GAP1_1_1	255
205	GNA1_1_1	256
206	HIS1_1_1	259
207	MLS1_1_1	268
208	NDE1_1_1	270
209	PFK2_1_1	271
210	SRB1_1_1	286
211	TRP1_1_1	288
212	YRB1_1_1	290
213	5triphosphatase_1_1	246
214	CCT8_1_1	235
215	CDC37_1_1	236
216	EDT1_1_1	251
217	ELF_1_1	252
218	FAL1_1_1	254
219	HTS1_1_1	260
220	MIG1_1_1	267
221	PRS1_1_1	276
222	RNR1_1_1	280
223	RPB7_1_1	281
224	RPL13_1_1	282
225	SHA3_1_1	284
226	YST1exon2_1_1	291
227	CCN1_1_1	292
228	CDC28_1_1	293
229	CLN2_1_1	294
230	CPH1_1_1	295

n	Probe Name	SeqID
231	CYB1_1_1	296
232	EFG1_1_1	297
233	MNT1_1_1	298
234	RBF1_1_1	299
235	RBF1_2_1	300
236	RIM101_1_1	301
237	RIM8_1_1	302
238	SEC14_1_1	303
239	SEC4_1_1	304
240	TUP1_1_1	305
241	YPT1_1_1	306
242	ZNF1CZF1_2_1	307
243	carO_1_1	2843
244	csuA_1_1	2854
245	csuA_B_1_1	2853
246	csuB_1_1	2852
247	csuC_1_1	2849
248	csuD_1_1	2848
249	dhbA_1_1	2845
250	dhbB_1_1	2846
251	gacS_1_1	2844
252	sid_1_1	2847
253	tnp-ACIBA_1_1	2850
254	waaA-ACIBA_1_1	2851
255	abc_1_1	2857
256	cysI_1_1	2860
257	dec_1_1	2859
258	furACIBA_1_1	2858
259	ompA-ACIBA_1_1	2863
260	por_1_1	2856
261	put1_1_1	2855
262	put3_1_1	2862
263	trpE_1_1	2861
264	asr_1_1	2876
265	ehuA_1_1	2885
266	ehuS_1_1	2878
267	ehuT_1_1	2883
268	ehuU_1_1	2882
269	ehuV_1_1	2879
270	lacZ_1_1	2877
271	ORF165_1_1	2881
272	ORF295_1_1	2884
273	ORF400_1_1	2886
274	slyA_1_1	2880
275	b1169_1_1	142
276	envZ_1_1	143

n	Probe Name	SeqID
277	fliCb_1_1	144
278	nfrB_1_1	145
279	nlpA_1_1	146
280	pilAe_1_1	147
281	yacH_1_1	148
282	yagX_1_1	149
283	ycdS_1_1	150
284	yciQ_1_1	151
285	ymcA_1_1	152
286	b1202_1_1	153
287	eae_1_1	154
288	eltB_1_1	155
289	escR_1_1	156
290	escT_1_1	157
291	escU_1_1	158
292	espB_1_1	159
293	fes_1_1	160
294	fes_2_1	161
295	fteA_1_1	162
296	hlyA_1_1	163
297	hlyB_1_1	164
298	iucA_1_1	165
299	iucB_1_1	166
300	iucC_1_1	167
301	papG_1_1	168
302	rfbE_1_1	169
303	shuA_1_1	170
304	SLTII_1_1	171
305	toxA-LTPA_1_1	172
306	VT2vaB_1_1	173
307	ABC-eltA_1_1	317
308	agrBfs_1_1	318
309	agrCfs_1_1	319
310	arcA_1_1	308
311	arcC_1_1	309
312	bkdA_1_1	310
313	cad_1_1	311
314	camE1_1_1	312
315	csrA_1_1	313
316	dacA_1_1	314
317	dfr_1_1	315
318	dhoD1a_1_1	316
319	dnaE_1_1	320
320	ebsA_1_1	321
321	ebsB_1_1	322
322	eep_1_1	323

n	Probe Name	SeqID
323	efaR_1_1	324
324	gls24_glsB_1_1	325
325	gph_1_1	326
326	gyrAEf_1_1	327
327	metEf_1_1	328
328	mntHCb2_1_1	329
329	mob2_1_1	330
330	mvaD_1_1	331
331	mvaE_1_1	332
332	parC_1_1	333
333	pcfG_1_1	334
334	phoZ_1_1	335
335	polC_1_1	336
336	ptb_1_1	337
337	recS1_1_1	338
338	rpoN_1_1	339
339	tms_1_1	340
340	tyrDC_1_1	341
341	tyrS_1_1	342
342	ace_1_1	351
343	asa1_1_1	343
344	asp1_1_1	344
345	cgh_1_1	345
346	cylA_1_1	346
347	cylB_1_1	347
348	cylI_1_1	348
349	cylL_cylS_1_1	349
350	cylM_1_1	350
351	ef00108_1_1	352
352	ef00109_1_1	353
353	ef0011_1_1	354
354	ef00113_1_1	355
355	ef0012_1_1	356
356	ef0022_1_1	357
357	ef0031_1_1	358
358	ef0032_1_1	359
359	ef0040_1_1	360
360	ef0058_1_1	361
361	enlA_1_1	362
362	esa_1_1	363
363	esp_1_1	364
364	gelE_1_1	365
365	groEL_1_1	366
366	groES_1_1	367
367	rt1_1_1	368
368	sala_1_1	369

n	Probe Name	SeqID
369	salb_1_1	370
370	sea1_1_1	371
371	sep1_1_1	372
372	vicK_1_1	373
373	yycH_1_1	374
374	yycI_1_1	375
375	yycJ_1_1	376
376	bglB_1_1	377
377	bglR_1_1	378
378	bglS_1_1	379
379	efmA_1_1	380
380	efmB_1_1	381
381	efmC_1_1	382
382	mreC_1_1	383
383	mreD_1_1	384
384	mvaDEfaecium_1_1	385
385	mvaEEfaecium_1_1	386
386	mvaK1Efaecium_1_1	387
387	mvaK2Efaecium_1_1	388
388	mvaSEfaecium_1_1	389
389	orf3_4Efaeciumb_1_1	390
390	orf6_7Efaecium_1_1	391
391	orf7_8Efaecium_1_1	392
392	orf9_10Efaecium_1_1	393
393	entA_entI_1_1	394
394	entD_1_1	395
395	entR_1_1	396
396	oep_1_1	397
397	sagA_1_2	398
398	H+ATPase_1_1	2887
399	cymA_1_1	449
400	cymD_1_1	450
401	cymE_1_1	451
402	cymH_1_1	452
403	cymI_1_1	453
404	cymJ_1_1	454
405	ddrA_1_1	455
406	fdt-1_1_1	456
407	fdt-2_1_1	457
408	fdt-3_1_1	458
409	gatY_1_1	459
410	hydH_1_1	460
411	masA_1_1	461
412	nasA_1_1	462
413	nasE_1_1	463
414	nasF_1_1	464

n	Probe Name	SeqID
415	pehX_1_1	465
416	pelX_1_1	466
417	tagH_1_1	467
418	tagK_1_1	468
419	tagT_1_1	469
420	acoA_1_1	408
421	acoB_1_1	409
422	acoC_1_1	410
423	ahlK_1_1	411
424	atsA_1_1	399
425	atsB_1_1	400
426	budC_1_1	401
427	citA_1_1	402
428	citW_1_1	403
429	citX_1_1	404
430	dalD_1_1	405
431	dalK_1_1	406
432	dalT_1_1	407
433	fimK_1_1	412
434	glfKPN2_1_1	413
435	liac_1_1	431
436	ltrA_1_1	414
437	mdcC_1_1	415
438	mdcF_1_1	416
439	mdcH_1_1	417
440	mrkA_1_1	418
441	mtrK_1_1	419
442	nifF_1_1	420
443	nifK_1_1	421
444	nifN_1_1	422
445	tyrP_1_1	423
446	ureA_1_1	424
447	wbbO_1_1	425
448	wza_1_1	426
449	wzb_1_1	427
450	wzmKPN2_1_1	428
451	wztKPN2_1_1	429
452	yojH_1_1	430
453	aldA_1_1	433
454	aldA_2_1	434
455	cim_1_1	432
456	hemly_1_1	435
457	pSL017_1_1	436
458	pSL020_1_1	437
459	rcsA_1_1	438
460	rmlC_1_1	439

n	Probe Name	SeqID
461	rmlD_1_1	440
462	waaG_1_1	441
463	wbbD_1_1	442
464	wbbM_1_1	443
465	wbbN_1_1	444
466	wbdA_1_1	445
467	wbdC_1_1	446
468	wztKpn_1_1	447
469	yibD_1_1	448
470	glpR_1_1	470
471	lasRb_1_1	471
472	OrfX_1_1	472
473	pa0260_1_1	473
474	pa0572_1_1	474
475	pa0625_1_1	475
476	pa0636_1_1	476
477	pa1046_1_1	477
478	pa1069_1_1	478
479	pa1846_1_1	479
480	pa3866_1_1	480
481	pa4082_1_1	481
482	pilAp_1_1	482
483	PilAp2_1_1	483
484	pilC_1_1	484
485	PstP_1_1	485
486	purK_1_1	486
487	uvrDII_1_1	487
488	vsmI_1_1	488
489	vsmR_1_2	489
490	xcpX_1_1	490
491	algB_1_1	494
492	algN_1_1	495
493	algR_1_1	496
494	aprA_1_1	491
495	aprE_1_1	492
496	ctx_1_2	493
497	ExoS_1_1	497
498	fpvA_1_1	498
499	lasRa_1_1	499
500	lipA_1_1	500
501	lipH_1_1	501
502	Orf159_1_2	502
503	Orf252_1_1	503
504	pchG_1_1	504
505	PhzA_1_1	505
506	PhzB_1_1	506

n	Probe Name	SeqID
507	PLC_1_1	507
508	plcN_1_1	508
509	plcR_1_1	509
510	pvdD_1_1	510
511	pvdF_1_2	511
512	pyocinS1_1_1	512
513	pyocinS1im_1_1	513
514	pyocinS2_1_1	514
515	pys2_1_1	515
516	pys2_2_1	516
517	rbf303_1_1	517
518	rhlA_1_1	518
519	rhlB_1_1	519
520	rhlR_1_1	520
521	TnAP41_1_2	521
522	toxA_1_1	522
523	aad_1_1	711
524	atfA_1_1	706
525	atfB_1_1	707
526	atfC_1_1	708
527	ccmPrmi1_1_1	709
528	cyaPrmi_1_1	710
529	flfB_1_1	712
530	flfD_1_1	713
531	flfN_1_1	714
532	flhD_1_1	715
533	floA_1_1	716
534	ftsK_1_1	717
535	gstB_1_1	718
536	hemCPrmi_1_1	719
537	hemDPrmi_1_1	720
538	hev_1_1	721
539	katA_1_1	722
540	lpp1_1_1	723
541	menE_1_1	724
542	mfd_1_1	725
543	nrpA_1_1	726
544	nrpB_1_1	727
545	nrpG_1_1	728
546	nrpS_1_1	729
547	nrpT_1_1	730
548	nrpU_1_1	731
549	pat_1_1	732
550	pmfA_1_1	733
551	pmfC_1_1	734
552	pmfE_1_1	735

n	Probe Name	SeqID
553	ppaA_1_1	736
554	rsbA_1_1	737
555	rsbC_1_1	738
556	speB_1_1	739
557	stmA_1_1	740
558	stmB_1_1	741
559	terA_1_1	742
560	terD_1_1	743
561	umoA_1_1	744
562	umoB_1_1	745
563	umoC_1_1	746
564	ureR_1_1	747
565	xerC_1_1	748
566	ygbA_1_1	749
567	flaA_1_1	750
568	flaD_1_1	751
569	fliA_1_1	752
570	hpmA_1_1	753
571	hpmB_1_1	754
572	lpsPrmi_1_1	755
573	mrpA_1_1	756
574	mrpB_1_1	757
575	mrpC_1_1	758
576	mrpD_1_1	759
577	mrpE_1_1	760
578	mrpF_1_1	761
579	mrpG_1_1	762
580	mrpH_1_1	763
581	mrpI_1_1	764
582	mrpJ_1_1	765
583	patA_1_1	766
584	putA_1_1	767
585	uca_1_1	768
586	ureDPrmi_1_1	769
587	ureEPrmi_1_1	770
588	ureFPrmi_1_1	771
589	zapA_1_1	772
590	zapB_1_1	773
591	zapD_1_1	774
592	zapE_1_1	775
593	envZPrvu_1_1	776
594	frdC_1_1	777
595	frdD_1_1	778
596	infBPrvu_1_1	779
597	lad_1_1	780
598	tna2_1_1	781

n	Probe Name	SeqID
599	end_1_1	782
600	pqrA_1_1	783
601	urg_1_1	784
602	eD_2_1	2892
603	eE_1_1	2890
604	eF_1_1	2899
605	et_1_1	2898
606	ORF2-STEMA_1_1	2897
607	ORF4-STEMA_1_1	2896
608	pam_1_1	2895
609	pmp-STEMA_1_1	2894
610	ppi_1_1	2893
611	smeE_1_1	2889
612	smeF4494_1_1	2901
613	StmPr1_1_1	2891
614	StmPr2_1_1	2900
615	0487Straga_1_1	625
616	0488Straga_1_1	626
617	0493Straga_1_1	627
618	0495Straga_1_1	628
619	0498Straga_1_1	629
620	0500Straga_1_1	630
621	0502Straga_1_1	631
622	0504Straga_1_1	632
623	cpsA1Strgal_1_1	606
624	cpsB1Strgal_1_1	607
625	cpsC1Strgal_1_1	608
626	cpsD1Strgal_1_1	609
627	cpsE1Strgal_1_1	610
628	cpsG1Strgal_1_1	611
629	cpsIStragal_1_1	612
630	cpsJStragal_1_1	613
631	cpsKStragal_1_1	614
632	cpsMStragal_1_1	615
633	cpsYStragal_1_1	616
634	cpsYStragal_2_1	617
635	cylBStraga_1_1	618
636	cylEStraga_1_1	619
637	cylFStraga_1_1	620
638	cylHStraga_1_1	621
639	cylIStraga_1_1	622
640	cylJStraga_1_1	623
641	cylKStraga_1_1	624
642	folDStraga_1_1	633
643	neuA1Strgal_1_1	634
644	neuB1Strgal_1_1	635

n	Probe Name	SeqID
645	neuC1Strgal_1_1	636
646	neuD1Strgal_1_1	637
647	recNStraga_1_1	638
648	0499Straga_1_1	642
649	CAMPfactor_1_1	640
650	CAMPfactor_2_1	641
651	hylStragal_1_1	643
652	lipStragal_1_1	644
653	16SStrepdysgal_1_1	2842
654	1760Strpneu_1_1	546
655	acyPStrpneu_1_1	547
656	cap1EStrpneu_1_1	523
657	cap1FStrpneu_1_1	524
658	cap1GStrpneu_1_1	525
659	cap3AStrpneu_1_1	526
660	cap3BStrpneu_1_1	527
661	celAStrpneu_1_1	528
662	celBStrpneu_1_1	529
663	cglAStrpneu_1_1	530
664	cglBStrpneu_1_1	531
665	cglCStrpneu_1_1	532
666	cglDStrpneu_1_1	533
667	cinA_1_1	534
668	cps14EStrpneum_1_1	535
669	cps14FStrpneum_1_1	536
670	cps14GStrpneum_1_1	537
671	cps14HStrpneum_1_1	538
672	cps19aHStrpneum_1_1	539
673	cps19aIStrpneum_1_1	540
674	cps19aKStrpneum_1_1	541
675	cps19fGStrpneum_1_1	542
676	cps23fGStrpneum_1_1	543
677	dexB_1_1	544
678	dinF_1_1	545
679	endAStrpneu_1_1	548
680	exoAStrpneu_1_1	549
681	exp72_1_1	550
682	fnlAStrpneu_1_1	551
683	fnlBStrpneu_1_1	552
684	fnlCStrpneu_1_1	553
685	gct18Strpneum_1_1	554
686	hexB1_1_1	555
687	hftsHstrpneu_1_1	556
688	immunofrag1Strpneu_1_1	557
689	immunofrag2Strpneu_2_1	558
690	immunofrag3Strpneu_2_1	559

n	Probe Name	SeqID
691	kdtBStrpneu_1_1	560
692	lysAStrpneu_1_1	561
693	pcpBStrpneu_1_1	562
694	pflCStrpneu_1_1	563
695	plpA_1_1	564
696	prtA1Strpneu_1_1	565
697	pspC1Strpneu_1_1	566
698	pspC2_1_1	567
699	purRStrpneu_1_1	568
700	pyrDAStrpneum_1_1	569
701	SP0828Strpneu_1_1	570
702	SP0830Strpneu_1_1	571
703	SP0833Strpneu_1_1	572
704	SP0837_38Strpneu_1_1	573
705	SP0839Strpneu_1_1	574
706	ugdStrpneu_1_1	575
707	uncC_1_1	576
708	vicXStrepneu_1_1	577
709	wchA6bStrpneum_1_1	578
710	wci4Strpneum_1_1	579
711	wciK4Strpneum_1_1	580
712	wciL4Strpneum_1_1	581
713	wciN6bStrpneum_1_1	582
714	wciO6bStrpneum_1_1	583
715	wciP6bStrpneum_1_1	584
716	wciY18Strpneum_1_1	585
717	wzdbStrpneum_1_1	586
718	wze6bStrpneum_1_1	587
719	wzy18Strpneum_1_1	588
720	wzy4Strpneum_1_1	589
721	wzy6bStrpneum_1_1	590
722	xpt_1_1	591
723	igaStrpneu_1_1	592
724	lytA_1_1	593
725	nanA_1_1	594
726	nanBStrpneu_1_1	595
727	pcpCStrpneu_1_1	596
728	ply_1_1	597
729	prtAStrpneu_1_1	598
730	pspA_1_2	599
731	SP0834Strpneu_1_1	600
732	SP0834Strpneu_1_2	601
733	sphtraStrpneu_1_1	602
734	wciJStrpneu_1_1	603
735	wziyStrpneu_1_1	604
736	wzxStrpneu_1_1	605

n	Probe Name	SeqID
737	cyclStrpyog_1_1	645
738	fah_rph_hlo_Strpyog_1_1	646
739	int_1_1	647
740	int315.5_1_1	648
741	murEStrpyog_1_1	649
742	oppA_1_1	650
743	oppCStrpyog_1_1	651
744	oppD_1_1	652
745	SPy0382Strpyog_1_1	653
746	SPy0390Strpyog_1_1	654
747	SpyM3_1351_1_1	655
748	vicXStrpyog_1_1	656
749	DNaseIStrpyog_1_1	657
750	fba2Strpyog_1_1	658
751	fhuAStrpyog_1_1	659
752	fhuB1Strpyog_1_1	660
753	fhuDStrpyog_1_1	661
754	fhuGStrpyog_1_1	662
755	hylA_1_1	663
756	hylP_1_1	664
757	hylp2_1_1	665
758	oppB_1_1	666
759	ropB_1_1	667
760	scpAStrpyog_1_1	668
761	sloStrpyog_1_1	669
762	smez-4Strpyog_1_1	670
763	sof_1_1	671
764	sof_2_1	672
765	speA_1_1	673
766	speB2Strpyog_1_1	674
767	speCStrpyog_1_1	675
768	speJStrpyog_1_1	676
769	srtBStrpyog_1_1	677
770	srtCStrpyog_1_1	678
771	srtEStrpyog_1_1	679
772	srtFStrpyog_1_1	680
773	srtGStrpyog_1_1	681
774	srtIStrpyog_1_1	682
775	srtKStrpyog_1_1	683
776	srtRStrpyog_1_1	684
777	srtTStrpyog_1_1	685
778	vicKStrpyog_1_1	686
779	573Stprmut_1_1	687
780	580SStprmut_1_1	688
781	581_582SStprmut_1_1	689
782	584SStprmut_1_1	690

n	Probe Name	SeqID
783	dltAStrmut_1_1	691
784	dltBStrmut_1_1	692
785	dltCppx1Strmut_1_1	693
786	dltDStrmut_1_1	694
787	lichStrbov_1_1	695
788	lytRStprmut_1_1	696
789	lytSStprmut_1_1	697
790	pepQStrrmut_1_1	698
791	pflCStrmut_1_1	699
792	recNStprmut_1_1	700
793	ytqBStrmut_1_1	701
794	hlyXStrmut_1_1	702
795	igaStrmitis_1_1	703
796	igaStrsanguis_1_1	704
797	perMStrmut_1_1	705
798	fasCAXStrdysg_1_1	2904
799	sloStrep_1_1	2905
800	cataSaur_1_1	1
801	cataSaur_1_2	2
802	clfA_1_1	3
803	clfB_1_1	4
804	coa_1_1	5
805	coa_1_2	6
806	coa_2_2	2903
807	coa_3_1	2902
808	epiP-bsaP_1_1	58
809	geh_1_1	59
810	gyrA_1_1	60
811	gyrB_1_1	61
812	hemB_1_1	62
813	hemC_1_1	63
814	hemD_1_1	64
815	hemN_1_1	65
816	hsdS_1_1	66
817	hsdS_2_1	67
818	lip_1_1	68
819	menC_1_1	69
820	murC_1_1	70
821	nuc_1_1	71
822	pdhD_1_1	72
823	rpoB_1_1	73
824	SAV0431_1_1	74
825	SAV0439_1_1	75
826	SAV0440_1_1	76
827	SAV0441_1_1	77
828	sigB_1_1	78

n	Probe Name	SeqID
829	spa_1_2	79
830	sstC_1_1	80
831	tag_1_1	81
832	tyrA_1_1	82
833	bsaE_1_1	100
834	bsaG_1_1	101
835	cap5h_1_1	102
836	cap5i_1_1	103
837	cap5j_1_1	104
838	cap5k_1_1	105
839	cap8H_1_1	106
840	cap8I_1_1	107
841	cap8J_1_1	108
842	cap8K_1_1	109
843	EDIN_1_1	113
844	eta_1_1	114
845	etb_1_1	115
846	hglA_1_1	116
847	hglA_2_1	117
848	hglB_1_1	118
849	hglC_2_1	119
850	hla_1_1	120
851	hlb_1_2	121
852	lukF_1_1	122
853	lukS_1_1	123
854	lukS_2_1	124
855	NAG_1_1	125
856	sak_1_1	126
857	sea_1_1	127
858	seb_1_1	128
859	sec1_1_1	129
860	seg_1_1	130
861	seh_1_1	131
862	sel_1_1	132
863	set15_1_1	133
864	set6_1_1	134
865	set7_1_1	135
866	set8_1_1	136
867	sprV8_1_1	137
868	tst_1_1	138
869	agrB_1_1	178
870	agrC_1_1	179
871	alphSE1368_1_1	180
872	ardeSE0106_1_1	174
873	ardeSE0107_1_1	175
874	aroiSE0105_1_1	176

n	Probe Name	SeqID
875	atlE_1_1	177
876	gad_1_1	181
877	glucSE1191_1_1	182
878	hsp10_1_1	183
879	icaA_1_1	184
880	icaB_1_1	185
881	mvaSSepid_1_1	186
882	nitreSE1972_1_1	187
883	nitreSE1974_1_1	188
884	nitreSE1975_1_1	189
885	oiamtSE1209_1_1	190
886	ORF1Sepid_1_1	191
887	ORF3bSepid_1_1	192
888	qacR_1_1	193
889	sin_1_1	194
890	ureSE1861_1_1	195
891	ureSE1863_1_1	196
892	ureSE1864_1_1	197
893	ureSE1865_1_1	198
894	ureSE1867_1_1	199
895	gcaD_1_1	200
896	hld_orf5_1_1	201
897	icaC_1_1	202
898	icaD_1_1	203
899	icaR_1_1	204
900	psm_beta1and2_1_1	205
901	purR_1_1	206
902	spoVG_1_1	207
903	yabJ_1_1	208
904	folQShaemolyt_1_1	209
905	mvaCShaemolyticus_1_1	210
906	mvaDShaemolyt_1_1	211
907	mvaK1Shaemolyticus_1_1	212
908	mvaSShaemolyticus_1_1	213
909	RNApolsigm_1_1	214
910	lipShaemolyt_1_1	215
911	ydhK_1_1	2906
912	agrB2Stalugd_1_1	216
913	agrC2Stalugd_1_1	217
914	agrCStalugd_1_1	218
915	slamStalugd_1_1	219
916	fblStalugd_1_1	220
917	slushABCStalugd_1_1	221
918	RNApolsigmSsapro_1_1	222
919	RNApolsigmSsapro_1_2	223
920	msrw1Stwar_1_1	224

n	Probe Name	SeqID
921	nukMStwar_1_1	225
922	proDStwar_1_1	226
923	proMStwar_1_1	227
924	sigrpoStwar_1_1	228
925	tnpStwar_1_1	229
926	gehAStwar_1_1	230
927	0135mihck_1_1	945
928	0270cap_1_1	947
929	FAN_1_1	946
930	p53_1_1	944

All genes were selected from the literature and databases, compared by BLAST analysis to all other sequences available in the NCBI database. Primers were designed to amplify gene segments of 200 to 800 bp length devoid of apparent homology with genes of other bacterial species and *Homo sapiens*. Gene segments were amplified by using the puReTaq Ready-To-Go PCR beads (Amersham Biosciences, Freiburg, Germany) and cloned into the pDrive Cloning Vector (Qiagen, Hilden, Germany) according to the recommendations of the suppliers and transformed into competent *Escherichia coli* (XL-1-Blue) cells using the calcium chloride protocol (Sambrook, J. and Russell, D.W. 2001. Molecular cloning: a laboratory manual, 3rd ed. Cold Spring Harbor Laboratory Press, New York, N.Y).

For quality control purposes, all gene probes were partially sequenced and verified (with the BigDye kit 1.1 and an 377 DNA sequencer; Applied Biosystems, Foster City, USA). All sequences obtained were identical or substantially identical (>90% sequence identity) to those obtained from the database.

For DNA-probe production 930 recombinant plasmids containing the 930 selected gene segments were used for re-amplification. Amplicons were purified and spotted in 4 replicates per slide on UltraGAPS™ Coated Slides (gamma amino propyl silane coated slides, Corning, NY, USA). Approximately 1 nl DNA (with a concentration of about 0.1 to about 0.2 ng/nl) per spot was spotted onto the slide with a Biorobitics Microgrid Microarrayer (Genomic Solutions, Ann Arbor, MI, USA).

<u>Example 2.5: Hybridization and scanning</u>

All experiments described represent dual co-hybridizations of two different target DNA samples labelled respectively with Cy3 or Cy5. After removal of unbound label, Cy3 and Cy5 labelled DNAs were pooled and mixed with 10 µg of Salmon Sperm

DNA and 50 µg of poly-A-DNA. The mixture was frozen in liquid nitrogen and lyophilized in the dark. Prior to hybridization the target DNA was reconstituted in 110 µl hybridization solution (30% formamide, 0.1% SDS, 5xSSC) and denatured by heating at 95°C for 3 min prior to hybridization. Hybridization was automatically performed with a TECAN Hybridization Station (HS400, TECAN, Salzburg, Austria). The arrays were prewashed at 42°C for 1 min with 5x SSC and prehybridized in 110 µl denatured prehybridization buffer (30% formamide, 0.1% SDS, 5xSSC, 10mg/ml BSA) for 30 min at 42°C at mild agitation. After injection of 110 µl labelled DNA, hybridization was performed at 60°C for 18 hours at medium agitation. The arrays were washed at 42°C in wash buffer I (1x SSC, 0.1% SDS) - three cycles of 30 sec wash time and 2 min soak time -, in wash buffer II (0.1x SSC, 0.1% SDS) - five cycles of 30 sec wash time and 2 min soak time – and wash buffer III (0.1x SSC) – four cycles of 30 sec wash time and 2 min soak time - and finally dried at 30°C with N_2 (2.7 bar) for 3 min. Hybridized arrays were scanned with GenPix Personal Axon 4100A laser scanner (Axon Instruments, Union City, CA, USA). Laser light of wavelengths at 532 and 635 nm was used to excite Cy3 dye and Cy5 dye, respectively. Fluorescent images were analyzed by the GenePix Pro 6.0 and Acuity 4.0 software (Axon Instruments). For each feature (gene probe) the median pixel intensity of wavelength 635 nm or 532 nm, respectively, was determined and the median background of the respective wavelength subtracted (F635 Median – B635 and F532 Median – B532, respectively).

Example 2.6: Specificity

In order to allow the simultaneous and rapid identification, differentiation and characterisation of pathogens causing sepsis, a microarray comprising a set of 930 gene probes of 200 to 800 bp length was developed (Tab. 7). The clinically most relevant sepsis causing pathogens were represented on the microarray by gene probes specific for the genera and species *E. coli* (31), *Staphylococcus aureus* (69) and coagulase negative staphylococci (58), *P. aeruginosa* (53), *Streptococcus* spp. (185), *Enterococcus* spp.(92), *Proteus* spp. (79), *Klebsiella* spp.(71), *Enterobacter* spp. (11), *Stenotrophomonas maltophilia* (13), *Acinetobacter baumannii* (21) and *Candida albicans* (86). To allow for parallel detection of antibiotic resistance determinants, the array contained 131 bacterial resistance gene probes.

To facilitate the optimization, validation and standardization of microarray analysis, a set of 29 control probes was included. Different 16S rRNA gene probes (18) served as positive hybridization controls for bacterial DNA. The gene probe rbcL_1_2 (segment of the rubisco gene of *Hordeum vulgaris*) was prelabelled with Cy3 and Cy5 and spotted onto each subarray for visualisation of the array orientation. Gene probes derived from *Mus musculus* (2), *Dictyostelium discoideum* (2), *Homo sapiens* (5), *Hordeum vulgaris* (1) were included as negative or positive hybridization controls. In all assays, one to five PCR-amplified DNA-segments, which had been added to each DNA preparation as a positive control, hybridized with the corresponding probes, indicating that labelling and hybridization had performed efficiently.
The specificity of the DNA-chip was validated with 44 well characterized clinical isolates and reference strains of the target species (40) as well as other related bacteria (4) (Table 8).

Tab. 8: Microorganism strains used for microarray validation. Non-target species are Nos 21, 25, 27 and 30.

No	Species	Strain	Dye
1	*A. baumannii*	DSM 30008	Cy5
2	*A. baumannii*	5256-2	Cy3
3	*P. aeruginosa*	ATCC 27853	Cy3
4	*E. coli*	CIP 105893	Cy3
5	*E. coli*	ATCC 25922	Cy5
6	*E. coli*	CIP 81.88	Cy3
7	*E. coli*	CIP 74.14	Cy5
8	*E. coli*	U10338-1	Cy5
9	*E. coli*	U10164-2	Cy5
10	*E. coli*	U10248-1	Cy5
11	*K. oxytoca*	DSM 4798	Cy5
12	*K. oxytoca*	U10274	Cy5
13	*K. pneumoniae*	DSM 681	Cy3
14	*K. pneumoniae*	O3-390	Cy3
15	*K. pneumoniae*	O8-889	Cy3
16	*P. mirabilis*	DSM 788	Cy5
17	*P. mirabilis*	U10515	Cy5

18	*P. mirabilis*	U9979-1	Cy5
19	*P. vulgaris*	DSM 2140	Cy5
20	*C. albicans*	ATCC 10231	Cy3
21	*E. casseliflavus*	UW703/95	Cy5
22	*E. faecalis*	ATCC 29212	Cy5
23	*E. faecalis*	UW700/95	Cy5
24	*E. faecium*	VRE 9182	Cy3
25	*E. gallinarum*	UW701/97	Cy3
26	*S. agalactiae*	DSM 2134	Cy5
27	*S. angiosus*	DSM 20563	Cy3
28	*S. bovis*	DSM 20480	Cy3
29	*S. dysgalactiae*	DSM 20662	Cy3
30	*S. gordonii*	DSM 6777	Cy5
31	*S. mutans*	DSM 20523	Cy3
32	*S. pneumoniae*	ATCC 49619	Cy3
33	*S. pyogenes*	DSM 11723	Cy3
34	*S. aureus*	ATCC 29213	Cy3
35	*S. aureus*	P2716	Cy3
36	*S. aureus*	C5010	Cy3
37	*S. aureus*	MW2	Cy3
38	*S. epidermidis*	ATCC 12228	Cy5
39	*S. epidermidis*	BC 1920	Cy5
40	*S. haemolyticus*	DSM 20263	Cy5
41	*S. hominis*	DSM 20228	Cy5
42	*S. lugdunensis*	DSM 4804	CY3
43	*S. saprophyticus*	ATCC 14953	Cy3
44	*S. warneri*	DSM 20316	Cy5

Hybridization experiments with DNA obtained from the respective target strains revealed hybridization profiles specific for the different species and genera (Fig. 7). In contrast, non-target organisms hybridized nearly exclusively with 16S rRNA (Probe Nos. 1-24) and antibiotic gene probes (Probe Nos. 26-156) (Fig. 7 panels G and H).

Example 2.7: Specificity of hybridization profiles for fungi

DNA of the fungus *Candida albicans* hybridized specifically with the *Candida* gene probes (Probe Nos. 157-242) including *Candida* resistance probes but not with bacterial 16 rRNA or species specific probes (Fig. 8, panel A). The specificity of two selected *Candida* probes is demonstrated in Fig. 8 panel B, the probes *ALS1* and *ASL43f* hybridized only with DNA obtained from *C. albicans* and not with any DNA obtained from the 43 bacterial strains.

Example 2.8: Specificity of hybridization profiles for Gram-negative bacteria

Strains of the genus *Klebsiella* showed specific hybridization with the *Klebsiella* gene probes (Probe Nos. 399-469). For this genus cross hybridization with lower intensity of the fluorescent signals was observed with some *E. coli* and *P. aeruginosa* probes (Nos. 275-306 and 470-522, respectively). This is also the case for bacterial strains of the genus *Proteus*, which show major hybridization with the *Proteus* gene probes allowing unambiguous identification (Probe Nos. 523-601). Vice versa, *P. aeruginosa* and *E. coli* can be easily identified by their hybridization profiles, but show minor cross hybridization with gene probes of *Klebsiella*, *E. coli* and *P. aeruginosa*, respectively. The *E. coli* reference strain CIP 105893 and the clinical isolate U10164-2 show nearly identical hybridization profiles, demonstrating the high reproducibility of the assay. Strains of the non-fermenting Gram-negative bacterium *A. baumannii* were readily identified based on their microarray hybridization profile showing specific hybridization to the *A. baumannii* gene probes (Nos. 243-263). The specificity of selected species specific probes is shown in Figure 9. The *A. baumannnii* probe *csuA* hybridized only with labelled DNA preparations derived from *A. baumannnii* strain DSM 30008 and the clinical *A. baumannii* isolate but not with any other of the 42 strains. The *P. aeruginosa* probe *PhzA* showed hybridization signals with a high intensity >60000 (Median fluorescence – background) only with DNA of the *P. aeruginosa* reference strain but with no other pathogen, demonstrating that although some *P. aeruginosa* probes (eg. *aprA*) show cross-hybridization with other Gram-negative species, unambiguous identification is feasible. Equally specific results were obtained with the *E. coli* probe *shuA*, which showed significant hybridization signals > 40000 only with DNA of the seven *E. coli* reference strains and clinical isolates. The closely related species *K. oxytoca* and *K. pneumoniae* were easily identified and discriminated from each other by the *K. oxytoca* probe *tagK* and the *K. pneumoniae* probe *acoC*. The *P. mirabilis* probe *hpmB* was highly specific for the three *P. mirabilis* strains and isolates, while probe *enzZPrvu* was specific for *P. vulgaris*.

Example 2.9: Specificity of hybridization profiles for Gram-positive bacteria of the genus *Enterococcus*

The microarray assay was highly specific in the identification of Gram-positive target species. Clinical isolates of the species *E. faecalis* and *E. faecium* could be identified and discriminated unambiguously by their hybridization profiles (Probe Nos. 307-375 and 376-398, respectively) (Fig. 7, panels E and F). The vancomycin resistant non-target strain *E. casseliflavus* (Fig. 7, panel G) showed hybridization to the bacterial 16S rRNA probes, the antibiotic resistance gene probes *vanC-2* (vancomycin resistance), *arr2* (Rifampin resistance) and *tetM* (tetracycline resistance) and the *S. aureus* probes *gyrA* (DNA gyrase subunit A), *rpoB* (RNA polymerase B subunit) and *sstC* (iron transport protein) only. This profile does not permit species identification but indicates a vancomycin resistant bacterium. A similar profile was obtained for the vancomycin resistant non-target strain *E. gallinarum* (not shown).

Example 2.10: Specificity of hybridization profiles for Gram-positive bacteria of the genus *Streptococcus*

Microarray hybridization assays performed with streptococcal DNA obtained from reference strains of *S. pneumoniae*, *S. pyogenes*, *S. mutans* and *S. agalactae* revealed species specific hybridization profiles and an excellent identification and discrimination of these target organisms (Fig. 7). The species *S. dysgalactiae* and *S. bovis* (*S. viridans* group) are each represented by a single gene probe on the array (fasCAXStrdysg and lichStrbov, respectively). These probes however exhibited specific hybridization to the target DNA only, and in this way permitted identification of the two species. Additionally both species showed hybridization with the 16S rRNA gene probes and *pbp2b* (penicillin binding protein of *S. pneumoniae*). Furthermore, *S. dysgalactiae* DNA hybridized with the probes *dacCStrpyog* and *murEStrpyog* and *S. bovis* DNA with *gyrA*, *rpoB* and *sstC* as *E. casseliflavus*. The non-target species *S. gordonii* and *S. angiosus* were readily discriminated by their hybridization profiles from other streptococci, *S. gordonii* showed hybridization to the 16S rRNA genes only, *S. angiosus* DNA hybridized additionally to *gyrB* and *rpoB* (Fig. 7 H).

Example 2.11: Specificity of hybridization profiles for Gram-positive bacteria of the genus *Staphylococcus*

Hybridization assays performed with *S. aureus* strains and *S. epidermidis* DNA produced very specific hybridization profiles with little cross hybridization (Fig. 7 AB). The specificity of selected probes for coagulase-negative staphylococci is shown in Fig. 10. *S. saprophyticus*, *S. haemolyticus*, *S. lugdnunensis*, *S. warneri* and *S. hominis* produced hybridization profiles distinct of those from *S. aureus* and *S. epidermidis*. For these species the following species specific probes were detected: *RNAposigmSsapro_1* and *_2* for *S. saprophyticus*, *RNApolisigm* and *mvaDShaemolyt* for *S. haemolyticus*, *agrCStalugd*, *slamStalugd* and *fblStalug* for *S. lugdunensis* and *proDStwar*, *gehAStwar* and *msrw1Stwar* for *S. warneri*. For *S. hominis* no probe proved to be species specific. The *S. hominis* derived probe *ydhK* cross hybridized with DNA of *S. hominis*, *S. epidermidis* and *S. haemolyticus*. However, certain probe patterns seem to be species specific for *S. hominis* and may allow identification and discrimination from *S. haemolyticus* and other CoNS (eg. hybridization of *ydhK, tnpStwar* and *sin* and absence of *mvaDShaemolyt* and *RNApolsigm*).

Example 2.12: Detection of antibiotic resistance determinants in Gram-negative bacteria

Susceptibility results determined by the VITEK2 system were compared to the results of the microarray hybridization assay for the simultaneous detection of antibiotic resistance genes.

For the Gram-negative enterobacteria *E. coli*, *K. pneumoniae*, *K. oxytoca*, *P. mirabilis* and *P. vulgaris* there was a 100% correlation between phenotypic resistance to aminoglycosides (Gentamycin, Tobramycin) and hybridization to at least one of the aminoglycoside gene probes *aacA4*, *aacC2*, *aadA*, *aacA* and_*aphDStwar* (Table 9).

Tab. 9: Aminoglycoside resistance of Gram-negative enterobacteria:

Strain	Aminoglycoside	Aminoglycoside

	resistance phenotype[a]	resistance gene
E. coli CIP 105893	GENi, TOB	aacA4, aadA
E. coli ATCC 25922	susceptible	-
E. coli CIP 81.88	susceptible	-
E. coli CIP 74.14	STR	-
E. coli U10338-1	GENi, TOB	*aacA4*
E. coli U10164-2	GEN, TOB	*aacC2*
E. coli U10248-1	GEN, TOB	*aacC2, strB*
K. oxytoca DSM 4798	susceptible	-
K. oxytoca U10274	susceptible	-
K. pneumoniae DSM 681	susceptible	-
K. pneumoniae 390	susceptible	-
K. pneumoniae 889	susceptible	*strB*
P. mirabilis DSM 788	susceptible	-
P. mirabilis U10515	susceptible	*aacC1*
P. mirabilis U9979-1	GEN, TOB	*aacC2, aadA, aacA_aphDStwar, strB*
P. vulgaris DSM 2140	susceptible	-

[a]GEN Gentamycin; TOB tobramycin; STR Streptomycin, resistance was not tested routinely; i, intermediary resistance

All enterobacterial strains which showed resistance to ß-lactam antibiotics (penicillin and cephalosporines) hybridized with at least one or more ß-lactamase gene probes (*blaCTX-M*, *blaFOX-3* and *-6*, *blaPRMI*, *blaTEM*, *blaSHV*, *blaOXY-KLOX*, *blaA*) (Table 10). There was no hybridization with the resistance gene probes *ampC* and *blaOXA* with any of the tested strains.

Tab. 10: ß-lactam resistance of Gram-negative enterobacteria:

Strain	ß-lactam resistance phenotype[a]	ß-lactamase genotype[b]
E. coli CIP 105893	ESBL	blaCTX-M-22, blaFOX-3, blaFOX-6, blaPRMI, blaTEM
E. coli ATCC 25922	susceptible	-
E. coli CIP 81.88	susceptible	-
E. coli CIP 74.14	susceptible	-
E. coli U10338-1	ESBL	blaCTX-M-22, blaTEM

E. coli U10164-2	ESBL	blaCTX-M-22, blaOXY, blaPRMI, blaTEM
E. coli U10248-1	AMP, ASU, MEZ, PRLi, TZPi, CXM	blaCTX-M-22, blaPRMI, blaSHV, blaTEM
K. oxytoca DSM 4798	AMP, ASUi, MEZi	blaOXY
K. oxytoca U10274	ESBL	blaCTX-M-22, blaOXY, blaOXY-KLOX, blaSHV
K. pneumoniae DSM 681	AMP, ASUi, MEZi, PRLi	blaCTX-M-22, blaFOX-3, blaFOX-6, blaOXY, blaSHV
K. pneumoniae 390	AMP, ASUi, MEZi	blaCTX-M-22, blaFOX-3, blaFOX-6, blaOXY, blaOXY-KLOX, blaSHV
K. pneumoniae 889	AMPi	blaCTX-M-22, blaFOX-3, blaFOX-6,blaOXY-KLOX, blaSHV
P. mirabilis DSM 788	KZi, CXMi, IMP	-
P. mirabilis U10515	ESBL,IMP	blaCTX-M-22,
P. mirabilis U9979-1	ESBL, IMP	blaCTX-M-22, blaFOX-3, blaFOX-6, blaOXY, blaPRMI, blaTEM
P. vulgaris DSM 2140	AMP, KZ	blaA[d]

[a]ESBL extended spectrum ß-lactamases; AMP, Ampicillin; ASU, Ampicillin/Sublactam; MEZ, Mezlocillin; PRL, Piperacillin; KZ, Cefazolin; CXM, Cefuroxim; IMP, Imipenem; i, intermediary resistance
[b]Fluorescence signals ≥10000 were considered positive.
[c]Fluorescence <10000; most fluorescence signals were <30000 for the hybridization assay with *P. vulgaris* DMS 2140

Strains susceptible to ß-lactam antibiotics did not show significant hybridization signals (Median fluorescence – background <10000) with any of the ß-lactamase gene probes. Although the hybridization pattern permitted the detection of different types of ß-lactamases (*blaTEM*, *blaSHV*, *blaCTX-M*, *blaFOX*), it did, however, not allow the detection and discrimination of extended spectrum ß-lactamases (ESBL). For the two clinical isolates of *P. mirabilis* the ESBL phenotype was correlated with hybridization of the *acrA*, *-B* and *–R* genes, which encode a multidrug efflux pump. Furthermore, for these two species, resistance to tetracycline was correlated with hybridization of the *P. mirabilis* derived gene probe *tetAJ*.

Example 2.13: Detection of antibiotic resistance determinants in Gram-positive bacteria

The phenotypic vancomycin resistance of the tested enterococci correlated by 100% with the genotypic resistance determined by microarray hybridization (Table 11).

Tab. 11: Phenotypic and genotypic resistance of *Enterococcus* strains.

Strain	Resistance phenotype[a]	Resistance genotype				
		Aminoglycosides	Glycopeptides	Macrolides	Tetracycline	Efflux pumps
E. casseliflavus UW703/95	VAN, DA. QDi	-	*vanC*	-	*tetM*	-
E. faecalis ATCC 29212	DA, Ei, QD, TET, SXT	-	-	-	*tetM*	*emeA*
E. faecalis UW700/95	VAN, DA, E, GEN, QD, STR, SXT	*aacA-aphD*	*vanB*	*ermB*	-	*emeA*[b]
E. faecium VRE9182	VAN, AMPi, DA, E, QDi, STR, Teicoplanin, TET	*aphA3*[b]	*vanA, vanB*	*ermB*	*tetL, tetM*	*msrCb*
E. gallinarum UW701/97	VAN, DA, QDi, SXT, TET	-	*vanC*	-	*tetM*	-

[a]VAN, vancomycin; DA, clindamycin; E, erythromycin; QD, quinupristin/dalfopristin (streptogramins); STR, streptomycin, TET, tetracycline; i, intermediary resistance. [b]Relative low fluorescence intensity (Median fluorescence – background <18.000).

Hybridization to the *vanC-2* gene was observed for the two vancomycin resistant strains *E. casseliflavus* and *E. gallinarum*, which contain the *vanC-2* and the *vanC-1* gene, respectively. The *vanB* gene was detected in the clinical isolates of *E. faecalis* UW700/95 and *E. faecium* VRE9182, the latter strain also hybridized with the *vanA* gene, indicating the presence of both genes. Furthermore, these two strains showed hybridization with aminoglycoside resistance genes (*aacA-aphD* and *aphA3*, respectively) and the macrolide resistance gene *ermB* (Table 11). The presence of efflux pumps involved in macrolide resistance was indicated by microarray hybridization for both *E. faecalis* strains (*emeA*) and *E. faecium* VRE9182 (*msrCb*).

Genotypic resistance to tetracycline was detected for four of the five strains (hybridization to *tetL* and/or *tetM*).

The tested streptococci showed phenotypic susceptibility to all tested antiobitics.

For staphylococci, there was 100% correlation between phenotypic resistance to penicillin and hybridization of the *blaZ* and the *blaIShaemolyt* gene probes and between oxacillin resistance and hybridization to the *mecA* gene (Table 12).

Tab. 12: Phenotypic and genotypic resistance of *Staphylococcus* strains.

Strain	Resistance phenotype[a]	Resistance genotype			
		Aminoglycosides	ß-lactams	Macrolides	Efflux pumps
S. aureus ATCC 29213	PEN	-	*blaZ, blaIShaemolyt*	-	*msrA, mreA*
S. aureus P2116	PEN, Ei, DAi,	-	*blaZ, blaIShaemolyt*	-	*msrA, mreA*
S. aureus C5010	TOB, PEN, OXA, E, DA	*aadD*	*blaZ, blaIShaemolyt, mecA*	*ermA*	*msrA, mreA*
S. aureus MW2	PEN, OXA, Trimethoprim	-		-	*msrA, mreA*
S. epidermidis ATCC 12228	PEN	-	*blaZ, blaIShaemolyt*	-	-
S. epidermidis BC1920	GEN, TOB, PEN, OXA, E, DA	*aadD, aacA-aphD, aacA_aphDStwar*	*blaZ, blaIShaemolyt, mecA*	*ermC*	-
S. haemolyticus DSM 20263	susceptible	-	-	-	-
S. hominis DSM 20228	susceptible	-	-	-	-
S. lugdunensis DSM 4804	susceptible	-	-	-	-
S. saprophyticus ATCC 14953	susceptible	-	-	-	-
S. warneri DSM 20316	susceptible	-	-	-	-

[a]PEN, penicillin; OXA, oxacillin; DA, clindamycin; E, erythromycin; TOB, tobramycin; GEN, gentamicin; i, intermediary resistance.

[b]Relative low fluorescence intensity (Median fluorescence – background <18.000).

Resistance to macrolides (erythromycin and clindamycin) was conferred by the *ermA* gene to the clinical MRSA isolate C5010 and by *ermC* to the MRSE isolate

BC1920. Both strains also showed resistance to tobramycin, which was conferred by the *aadD* gene, additionally the *S. epidermidis* isolate was resistant to gentamycin, due to posession of the *aacA-aphD* gene (Table 12). With the exception of the *S. epidermidis* strains, all CoNS showed a susceptible phenotype and did not hybridize with any of the resistance gene probes.

Example 2.14: Strain discrimination and detection of virulence genes in S. aureus

Virulence gene probes, showing varying fluorescence intensities after hybridization with DNA of four different *S. aureus* strains are listed in Table 13.

Tab. 13: Hybridization of *S. aureus* virulence gene probes: -, Median fluorescence <10000; +, Median fluorescence ≥10000-20000; ++, Median fluorescence >20000-50000; +++, Median fluorescence <50000. Percentage of identity for gene probe sequences complementary to the genes present in the fully sequenced strain MW2 is given in the last column.

***S. aureus* virulence gene probes**	***S. arueus* ATCC 29213**	***S. aureus* P2116**	**MRSA C5010**	**MRSA MW2**	**Sequence identity with MW2 genome sequence**
epiP-bsaP	-	-	-	+++	100%
hsdS1	+++	-	+++	-	Not present
SAV0441	+++	-	+++	+	Not present
bsaE	-	-	+	+++	100%
bsaG	++	++	+++	+++	100%
cap5	+++	-	+++	-	Not present
cap8	-	+++	-	+++	100%
EDIN	+++	-	-	-	Not present -
lukF	+	++	++	+++	95%
lukS1	+	+	++	+++	98%
sea	+++	-	+++	+++	100%
sec1	-	-	+	+++	98%
seg1	+++	-	+++	+	Not present

seh	-	+	++	+++	100%
sel	-	-	+	+++	99%

For other *S. aureus* gene probes the fluorescence intensities were either very low (MF-B <10000) for all four strains indicating the absence of the according gene (eg. *tst, eta* or *etb*) or very high (MF-B >50000), indicating the presence of the according gene in all four strains (eg. *hglA*, *hglB*, *hglC, NAG*, *sak*, *set*, *sprV8*). Capsular polysaccharides enhance microbial virulence by rendering the bacterium resistant to phagocytosis. Among the eleven capsular serotypes of *S. aureus*, serotypes 5 and 8 account for ≈25% and 50%, respectively, of isolates recovered from humans. Moreover, these two serotypes, carrying the genes *cap5* and *cap8*, are prevalent among isolates from clinical infections as well as from commensal sources. By microarray hybridization the *cap5* gene was detected in the ATCC 29213 strain and the clinical MRSA isolate C5010, while *cap8* was detected in the clinical isolate P2116 and the community-aquired MRSA strain MW2 (Table 13). The latter strain hybridized to many virulence gene probes including the leukocidin gene probes *lukF* and *lukS* and the enterotoxin gene probes *sea*, *sec*, *seh* and *sel*. This microarray gene profile is in perfect concordance with genome sequence of this fully sequenced strain, which produces the Panton-Valentine leukocidin (PVL), encoded by *lukF* and *lukS*. Panton-Valentine leukocidin forms non-specific pores in leukocyte plasma membranes, which result in increased permeability and eventual host cell lysis. While strain MW2 does not harbor the gene *seg* encoding enterotoxin G, this gene was detected in the ATCC strain and the clinical MRSA isolate C5010, which both also showed hybridization with *sea* (Enterotoxin A). In contrast, the clinical isolate P2116 showed no or only minor hybridization with these virulence probes. From these results it can be concluded that microarray hybridization patterns allow the discrimination of different *S. aureus* strains as well as the detection of clinically relevant virulence determinants.

Example 2.15: Strain discrimination and detection of virulence genes in *E. coli*

Virulence gene probes, showing varying fluorescence intensities after hybridization with DNA of seven different *E. coli* strains are listed in Table 14.

Tab. 14: Hybridization of *E. coli* virulence gene probes: -, Median fluorescence <10000; +, Median fluorescence ≥10000 -20000; ++, Median fluorescence >20000-50000; +++, Median fluorescence <50000.

	E. coli **CIP 105893 ESBL**	***E. coli*** **ATCC 25922**	***E. coli*** **CIP 81.88**	***E. coli*** **CIP 74.14**	***E. coli*** **U10338-1 ESBL**	***E. coli*** **U10164-2 ESBL, GEN-R**	***E. coli*** **U10248-1 GEN-R**
b1169	+++	++	+++	++	+++	+++	-
ycdS	+++	++	+++	++	+++	+++	-
ymcA	+++	+	+++	-	-	+	+
b1202	+++	-	+++	-	-	-	+++
fteA	+	+	-	++	+++	+++	++
iucA	+	++	-	-	+++	+++	+++
iucB	-	++	-	-	++	+++	++
iucC	+	++	-	-	+++	+++	+++
papG	-	+++	-	++	-	-	+++

None of the listed genes was detected in all seven strains. Major hybridization of the *iuc* aerobactin synthesis genes was detected for four strains. The genes *fteA* (allele of *papA*) and *papG*, both involved in adhesion to host cells and virulence in urinary tract infections were detected in five strains. The three clinical isolates U10338-1, U10164-2 and U10248-1 were all isolated from patients with urinary tract infections. Based on the virulence hybridization pattern, strains U10338-1 and U10164-2 are nearly identical, while strain U10248-1 can be clearly discriminated.

Sequence Listing – Free text

a) Probe sequences

SEQ ID NO	Probe name	Template source
1	cataSaur_1_1	*Staphylococcus aureus*
2	cataSaur_1_2	*Staphylococcus aureus*
3	clfA_1_1	*Staphylococcus aureus*
4	clfB_1_1	*Staphylococcus aureus*
5	coa_1_1	*Staphylococcus aureus*
6	coa_1_2	*Staphylococcus aureus*
7	I-clpC_1_1	*Staphylococcus aureus*
8	I-clpP_1_1	*Staphylococcus aureus*
9	I-ctaA_1_1	*Staphylococcus aureus*
10	I-ctsR_1_1	*Staphylococcus aureus*
11	I-dltA_1_1	*Staphylococcus aureus*
12	I-dltB_1_1	*Staphylococcus aureus*
13	I-dltC_1_1	*Staphylococcus aureus*
14	I-dnaK_1_1	*Staphylococcus aureus*
15	I-elkT_1_1	*Staphylococcus aureus*
16	I-femD_1_1	*Staphylococcus aureus*
17	I-glnA_1_1	*Staphylococcus aureus*
18	I-glnR_1_1	*Staphylococcus aureus*
19	I-grlA_1_1	*Staphylococcus aureus*
20	I-grlB_1_1	*Staphylococcus aureus*
21	I-groEL_1_1	*Staphylococcus aureus*
22	I-groES_1_1	*Staphylococcus aureus*
23	I-hemA_1_1	*Staphylococcus aureus*
24	I-hemE_1_1	*Staphylococcus aureus*
25	I-hemH_1_1	*Staphylococcus aureus*
26	I-hemL_1_1	*Staphylococcus aureus*
27	I-hemY_1_1	*Staphylococcus aureus*
28	I-lepA_1_1	*Staphylococcus aureus*
29	I-lrgA_1_1	*Staphylococcus aureus*
30	I-lrgB_1_1	*Staphylococcus aureus*
31	I-lytM_1_1	*Staphylococcus aureus*
32	I-menB_1_1	*Staphylococcus aureus*
33	I-menD_1_1	*Staphylococcus aureus*
34	I-menE_1_1	*Staphylococcus aureus*
35	I-menF_1_1	*Staphylococcus aureus*
36	I-mreB_1_1	*Staphylococcus aureus*
37	I-mreR_1_1	*Staphylococcus aureus*
38	I-mutL_1_1	*Staphylococcus aureus*
39	I-mutS_1_1	*Staphylococcus aureus*
40	I-NAG_1_1	*Staphylococcus aureus*
41	I-pbg_1_1	*Staphylococcus aureus*
42	I-pbpF_1_1	*Staphylococcus aureus*
43	I-pdhB_1_1	*Staphylococcus aureus*

SEQ ID NO	Probe name	Template source
44	I-pdhC_1_1	*Staphylococcus aureus*
45	I-rsbU_1_1	*Staphylococcus aureus*
46	I-rsbV_1_1	*Staphylococcus aureus*
47	I-rsbW_1_1	*Staphylococcus aureus*
48	I-sgp_1_1	*Staphylococcus aureus*
49	I-sirR_1_1	*Staphylococcus aureus*
50	I-sodA_1_1	*Staphylococcus aureus*
51	I-sodB_1_1	*Staphylococcus aureus*
52	I-sstA_1_1	*Staphylococcus aureus*
53	I-sstB_1_1	*Staphylococcus aureus*
54	I-sstC_1_1	*Staphylococcus aureus*
55	I-sstD_1_1	*Staphylococcus aureus*
56	I-trx_1_1	*Staphylococcus aureus*
57	I-yhiN_1_1	*Staphylococcus aureus*
58	epiP-bsaP_1_1	*Staphylococcus aureus*
59	geh_1_1	*Staphylococcus aureus*
60	gyrA_1_1	*Staphylococcus aureus*
61	gyrB_1_1	*Staphylococcus aureus*
62	hemB_1_1	*Staphylococcus aureus*
63	hemC_1_1	*Staphylococcus aureus*
64	hemD_1_1	*Staphylococcus aureus*
65	hemN_1_1	*Staphylococcus aureus*
66	hsdS_1_1	*Staphylococcus aureus*
67	hsdS_2_1	*Staphylococcus aureus*
68	lip_1_1	*Staphylococcus aureus*
69	menC_1_1	*Staphylococcus aureus*
70	murC_1_1	*Staphylococcus aureus*
71	nuc_1_1	*Staphylococcus aureus*
72	pdhD_1_1	*Staphylococcus aureus*
73	rpoB_1_1	*Staphylococcus aureus*
74	SAV0431_1_1	*Staphylococcus aureus*
75	SAV0439_1_1	*Staphylococcus aureus*
76	SAV0440_1_1	*Staphylococcus aureus*
77	SAV0441_1_1	*Staphylococcus aureus*
78	sigB_1_1	*Staphylococcus aureus*
79	spa_1_2	*Staphylococcus aureus*
80	sstC_1_1	*Staphylococcus aureus*
81	tag_1_1	*Staphylococcus aureus*
82	tyrA_1_1	*Staphylococcus aureus*
83	I-aroC_1_1	*Staphylococcus aureus*
84	I-aroA_1_1	*Staphylococcus aureus*
85	I-cna_1_1	*Staphylococcus aureus*
86	I-ebpS_1_1	*Staphylococcus aureus*
87	I-eno_1_1	*Staphylococcus aureus*
88	I-fbpA_1_1	*Staphylococcus aureus*
89	I-fib_1_1	*Staphylococcus aureus*

SEQ ID NO	Probe name	Template source
90	I-fnbB_1_1	*Staphylococcus aureus*
91	I-srtA_1_1	*Staphylococcus aureus*
92	I-stpC_1_1	*Staphylococcus aureus*
93	I-fnbA_1_1	*Staphylococcus aureus*
94	I-spa_1_1	*Staphylococcus aureus*
95	I-aroE_1_1	*Staphylococcus aureus*
96	I-aroF_1_1	*Staphylococcus aureus*
97	I-aroG_1_1	*Staphylococcus aureus*
98	I-asp23_1_1	*Staphylococcus aureus*
99	I-atl_1_1	*Staphylococcus aureus*
100	bsaE_1_1	*Staphylococcus aureus*
101	bsaG_1_1	*Staphylococcus aureus*
102	cap5h_1_1	*Staphylococcus aureus*
103	cap5i_1_1	*Staphylococcus aureus*
104	cap5j_1_1	*Staphylococcus aureus*
105	cap5k_1_1	*Staphylococcus aureus*
106	cap8H_1_1	*Staphylococcus aureus*
107	cap8I_1_1	*Staphylococcus aureus*
108	cap8J_1_1	*Staphylococcus aureus*
109	cap8K_1_1	*Staphylococcus aureus*
110	I-hld_1_1	*Staphylococcus aureus*
111	I-hysA_1_1	*Staphylococcus aureus*
112	I-IgGbg_1_1	*Staphylococcus aureus*
113	EDIN_1_1	*Staphylococcus aureus*
114	eta_1_1	*Staphylococcus aureus*
115	etb_1_1	*Staphylococcus aureus*
116	hglA_1_1	*Staphylococcus aureus*
117	hglA_2_1	*Staphylococcus aureus*
118	hglB_1_1	*Staphylococcus aureus*
119	hglC_2_1	*Staphylococcus aureus*
120	hla_1_1	*Staphylococcus aureus*
121	hlb_1_2	*Staphylococcus aureus*
122	lukF_1_1	*Staphylococcus aureus*
123	lukS_1_1	*Staphylococcus aureus*
124	lukS_2_1	*Staphylococcus aureus*
125	NAG_1_1	*Staphylococcus aureus*
126	sak_1_1	*Staphylococcus aureus*
127	sea_1_1	*Staphylococcus aureus*
128	seb_1_1	*Staphylococcus aureus*
129	sec1_1_1	*Staphylococcus aureus*
130	seg_1_1	*Staphylococcus aureus*
131	seh_1_1	*Staphylococcus aureus*
132	sel_1_1	*Staphylococcus aureus*
133	set15_1_1	*Staphylococcus aureus*
134	set6_1_1	*Staphylococcus aureus*
135	set7_1_1	*Staphylococcus aureus*

SEQ ID NO	Probe name	Template source
136	set8_1_1	*Staphylococcus aureus*
137	sprV8_1_1	*Staphylococcus aureus*
138	tst_1_1	*Staphylococcus aureus*
139	I-sdrC_1_1	*Staphylococcus aureus*
140	I-sdrD_1_1	*Staphylococcus aureus*
141	I-sdrE_1_1	*Staphylococcus aureus*
142	b1169_1_1	*Escherichia coli*
143	envZ_1_1	*Escherichia coli*
144	fliCb_1_1	*Escherichia coli*
145	nfrB_1_1	*Escherichia coli*
146	nlpA_1_1	*Escherichia coli*
147	pilAe_1_1	*Escherichia coli*
148	yacH_1_1	*Escherichia coli*
149	yagX_1_1	*Escherichia coli*
150	ycdS_1_1	*Escherichia coli*
151	yciQ_1_1	*Escherichia coli*
152	ymcA_1_1	*Escherichia coli*
153	b1202_1_1	*Escherichia coli*
154	eae_1_1	*Escherichia coli*
155	eltB_1_1	*Escherichia coli*
156	escR_1_1	*Escherichia coli*
157	escT_1_1	*Escherichia coli*
158	escU_1_1	*Escherichia coli*
159	espB_1_1	*Escherichia coli*
160	fes_1_1	*Escherichia coli*
161	fes_2_1	*Escherichia coli*
162	fteA_1_1	*Escherichia coli*
163	hlyA_1_1	*Escherichia coli*
164	hlyB_1_1	*Escherichia coli*
165	iucA_1_1	*Escherichia coli*
166	iucB_1_1	*Escherichia coli*
167	iucC_1_1	*Escherichia coli*
168	papG_1_1	*Escherichia coli*
169	rfbE_1_1	*Escherichia coli*
170	shuA_1_1	*Escherichia coli*
171	SLTII_1_1	*Escherichia coli*
172	toxA-LTPA_1_1	*Escherichia coli*
173	VT2vaB_1_1	*Escherichia coli*
174	ardeSE0106_1_1	*Staphylococcus epidermidis*
175	ardeSE0107_1_1	*Staphylococcus epidermidis*
176	aroiSE0105_1_1	*Staphylococcus epidermidis*
177	atlE_1_1	*Staphylococcus epidermidis*
178	agrB_1_1	*Staphylococcus epidermidis*
179	agrC_1_1	*Staphylococcus epidermidis*
180	alphSE1368_1_1	*Staphylococcus epidermidis*
181	gad_1_1	*Staphylococcus epidermidis*

SEQ ID NO	Probe name	Template source
182	glucSE1191_1_1	*Staphylococcus epidermidis*
183	hsp10_1_1	*Staphylococcus epidermidis*
184	icaA_1_1	*Staphylococcus epidermidis*
185	icaB_1_1	*Staphylococcus epidermidis*
186	mvaSSepid_1_1	*Staphylococcus epidermidis*
187	nitreSE1972_1_1	*Staphylococcus epidermidis*
188	nitreSE1974_1_1	*Staphylococcus epidermidis*
189	nitreSE1975_1_1	*Staphylococcus epidermidis*
190	oiamtSE1209_1_1	*Staphylococcus epidermidis*
191	ORF1Sepid_1_1	*Staphylococcus epidermidis*
192	ORF3bSepid_1_1	*Staphylococcus epidermidis*
193	qacR_1_1	*Staphylococcus epidermidis*
194	sin_1_1	*Staphylococcus epidermidis*
195	ureSE1861_1_1	*Staphylococcus epidermidis*
196	ureSE1863_1_1	*Staphylococcus epidermidis*
197	ureSE1864_1_1	*Staphylococcus epidermidis*
198	ureSE1865_1_1	*Staphylococcus epidermidis*
199	ureSE1867_1_1	*Staphylococcus epidermidis*
200	gcaD_1_1	*Staphylococcus epidermidis*
201	hld_orf5_1_1	*Staphylococcus epidermidis*
202	icaC_1_1	*Staphylococcus epidermidis*
203	icaD_1_1	*Staphylococcus epidermidis*
204	icaR_1_1	*Staphylococcus epidermidis*
205	psm_beta1and2_1_1	*Staphylococcus epidermidis*
206	purR_1_1	*Staphylococcus epidermidis*
207	spoVG_1_1	*Staphylococcus epidermidis*
208	yabJ_1_1	*Staphylococcus epidermidis*
209	folQShaemolyt_1_1	*Staphylococcus haemolyticus*
210	mvaCShaemolyticus_1_1	*Staphylococcus haemolyticus*
211	mvaDShaemolyt_1_1	*Staphylococcus haemolyticus*
212	mvaK1Shaemolyticus_1_1	*Staphylococcus haemolyticus*
213	mvaSShaemolyticus_1_1	*Staphylococcus haemolyticus*
214	RNApolsigm_1_1	*Staphylococcus haemolyticus*
215	lipShaemolyt_1_1	*Staphylococcus haemolyticus*
216	agrB2Stalugd_1_1	*Staphylococcus lugdunensis*
217	agrC2Stalugd_1_1	*Staphylococcus lugdunensis*
218	agrCStalugd_1_1	*Staphylococcus lugdunensis*
219	slamStalugd_1_1	*Staphylococcus lugdunensis*
220	fblStalugd_1_1	*Staphylococcus lugdunensis*
221	slushABCStalugd_1_1	*Staphylococcus lugdunensis*
222	RNApolsigmSsapro_1_1	*Staphylococcus saprophyticus*
223	RNApolsigmSsapro_1_2	*Staphylococcus saprophyticus*
224	msrw1Stwar_1_1	*Staphylococcus warneri*
225	nukMStwar_1_1	*Staphylococcus warneri*
226	proDStwar_1_1	*Staphylococcus warneri*
227	proMStwar_1_1	*Staphylococcus warneri*

SEQ ID NO	Probe name	Template source
228	sigrpoStwar_1_1	*Staphylococcus warneri*
229	tnpStwar_1_1	*Staphylococcus warneri*
230	gehAStwar_1_1	*Staphylococcus warneri*
231	ARG56_1_1	*Candida albicans*
232	ASL43f_1_1	*Candida albicans*
233	BGL2_1_1	*Candida albicans*
234	CACHS3_1_1	*Candida albicans*
235	CCT8_1_1	*Candida albicans*
236	CDC37_1_1	*Candida albicans*
237	CEF3_1_1	*Candida albicans*
238	CHS1_1_1	*Candida albicans*
239	CHS2_1_1	*Candida albicans*
240	CHS4_1_1	*Candida albicans*
241	CHS5_1_1	*Candida albicans*
242	CHT1_1_1	*Candida albicans*
243	CHT2_1_1	*Candida albicans*
244	CHT4_1_1	*Candida albicans*
245	CSA1_1_1	*Candida albicans*
246	5triphosphatase_1_1	*Candida albicans*
247	AAF1_1_1	*Candida albicans*
248	ADH1_1_1	*Candida albicans*
249	ALS1_1_1	*Candida albicans*
250	ALS7_1_1	*Candida albicans*
251	EDT1_1_1	*Candida albicans*
252	ELF_1_1	*Candida albicans*
253	ESS1_1_1	*Candida albicans*
254	FAL1_1_1	*Candida albicans*
255	GAP1_1_1	*Candida albicans*
256	GNA1_1_1	*Candida albicans*
257	GSC1_1_1	*Candida albicans*
258	GSL1_1_1	*Candida albicans*
259	HIS1_1_1	*Candida albicans*
260	HTS1_1_1	*Candida albicans*
261	HWP1_2_1	*Candida albicans*
262	HYR1_1_1	*Candida albicans*
263	INT1a_1_1	*Candida albicans*
264	KRE15f_1_1	*Candida albicans*
265	KRE6_1_1	*Candida albicans*
266	KRE9_1_1	*Candida albicans*
267	MIG1_1_1	*Candida albicans*
268	MLS1_1_1	*Candida albicans*
269	MP65_1_1	*Candida albicans*
270	NDE1_1_1	*Candida albicans*
271	PFK2_1_1	*Candida albicans*
272	PHR1_1_1	*Candida albicans*
273	PHR2_1_1	*Candida albicans*

SEQ ID NO	Probe name	Template source
274	PHR3_1_1	*Candida albicans*
275	PRA1_1_1	*Candida albicans*
276	PRS1_1_1	*Candida albicans*
277	RBT1_1_1	*Candida albicans*
278	RBT4_1_1	*Candida albicans*
279	RHO1_1_1	*Candida albicans*
280	RNR1_1_1	*Candida albicans*
281	RPB7_1_1	*Candida albicans*
282	RPL13_1_1	*Candida albicans*
283	RVS167_1_1	*Candida albicans*
284	SHA3_1_1	*Candida albicans*
285	SKN1_1_1	*Candida albicans*
286	SRB1_1_1	*Candida albicans*
287	TCA1_1_1	*Candida albicans*
288	TRP1_1_1	*Candida albicans*
289	YAE1_1_1	*Candida albicans*
290	YRB1_1_1	*Candida albicans*
291	YST1exon2_1_1	*Candida albicans*
292	CCN1_1_1	*Candida albicans*
293	CDC28_1_1	*Candida albicans*
294	CLN2_1_1	*Candida albicans*
295	CPH1_1_1	*Candida albicans*
296	CYB1_1_1	*Candida albicans*
297	EFG1_1_1	*Candida albicans*
298	MNT1_1_1	*Candida albicans*
299	RBF1_1_1	*Candida albicans*
300	RBF1_2_1	*Candida albicans*
301	RIM101_1_1	*Candida albicans*
302	RIM8_1_1	*Candida albicans*
303	SEC14_1_1	*Candida albicans*
304	SEC4_1_1	*Candida albicans*
305	TUP1_1_1	*Candida albicans*
306	YPT1_1_1	*Candida albicans*
307	ZNF1CZF1_2_1	*Candida albicans*
308	arcA_1_1	*Enterococcus faecalis*
309	arcC_1_1	*Enterococcus faecalis*
310	bkdA_1_1	*Enterococcus faecalis*
311	cad_1_1	*Enterococcus faecalis*
312	camE1_1_1	*Enterococcus faecalis*
313	csrA_1_1	*Enterococcus faecalis*
314	dacA_1_1	*Enterococcus faecalis*
315	dfr_1_1	*Enterococcus faecalis*
316	dhoD1a_1_1	*Enterococcus faecalis*
317	ABC-eltA_1_1	*Enterococcus faecalis*
318	agrBfs_1_1	*Enterococcus faecalis*
319	agrCfs_1_1	*Enterococcus faecalis*

SEQ ID NO	Probe name	Template source
320	dnaE_1_1	*Enterococcus faecalis*
321	ebsA_1_1	*Enterococcus faecalis*
322	ebsB_1_1	*Enterococcus faecalis*
323	eep_1_1	*Enterococcus faecalis*
324	efaR_1_1	*Enterococcus faecalis*
325	gls24_glsB_1_1	*Enterococcus faecalis*
326	gph_1_1	*Enterococcus faecalis*
327	gyrAEf_1_1	*Enterococcus faecalis*
328	metEf_1_1	*Enterococcus faecalis*
329	mntHCb2_1_1	*Enterococcus faecalis*
330	mob2_1_1	*Enterococcus faecalis*
331	mvaD_1_1	*Enterococcus faecalis*
332	mvaE_1_1	*Enterococcus faecalis*
333	parC_1_1	*Enterococcus faecalis*
334	pcfG_1_1	*Enterococcus faecalis*
335	phoZ_1_1	*Enterococcus faecalis*
336	polC_1_1	*Enterococcus faecalis*
337	ptb_1_1	*Enterococcus faecalis*
338	recS1_1_1	*Enterococcus faecalis*
339	rpoN_1_1	*Enterococcus faecalis*
340	tms_1_1	*Enterococcus faecalis*
341	tyrDC_1_1	*Enterococcus faecalis*
342	tyrS_1_1	*Enterococcus faecalis*
343	asa1_1_1	*Enterococcus faecalis*
344	asp1_1_1	*Enterococcus faecalis*
345	cgh_1_1	*Enterococcus faecalis*
346	cylA_1_1	*Enterococcus faecalis*
347	cylB_1_1	*Enterococcus faecalis*
348	cylI_1_1	*Enterococcus faecalis*
349	cylL_cylS_1_1	*Enterococcus faecalis*
350	cylM_1_1	*Enterococcus faecalis*
351	ace_1_1	*Enterococcus faecalis*
352	ef00108_1_1	*Enterococcus faecalis*
353	ef00109_1_1	*Enterococcus faecalis*
354	ef0011_1_1	*Enterococcus faecalis*
355	ef00113_1_1	*Enterococcus faecalis*
356	ef0012_1_1	*Enterococcus faecalis*
357	ef0022_1_1	*Enterococcus faecalis*
358	ef0031_1_1	*Enterococcus faecalis*
359	ef0032_1_1	*Enterococcus faecalis*
360	ef0040_1_1	*Enterococcus faecalis*
361	ef0058_1_1	*Enterococcus faecalis*
362	enlA_1_1	*Enterococcus faecalis*
363	esa_1_1	*Enterococcus faecalis*
364	esp_1_1	*Enterococcus faecalis*
365	gelE_1_1	*Enterococcus faecalis*

SEQ ID NO	Probe name	Template source
366	groEL_1_1	*Enterococcus faecalis*
367	groES_1_1	*Enterococcus faecalis*
368	rt1_1_1	*Enterococcus faecalis*
369	sala_1_1	*Enterococcus faecalis*
370	salb_1_1	*Enterococcus faecalis*
371	sea1_1_1	*Enterococcus faecalis*
372	sep1_1_1	*Enterococcus faecalis*
373	vicK_1_1	*Enterococcus faecalis*
374	yycH_1_1	*Enterococcus faecalis*
375	yycI_1_1	*Enterococcus faecalis*
376	yycJ_1_1	*Enterococcus faecalis*
377	bglB_1_1	*Enterococcus faecium*
378	bglR_1_1	*Enterococcus faecium*
379	bglS_1_1	*Enterococcus faecium*
380	efmA_1_1	*Enterococcus faecium*
381	efmB_1_1	*Enterococcus faecium*
382	efmC_1_1	*Enterococcus faecium*
383	mreC_1_1	*Enterococcus faecium*
384	mreD_1_1	*Enterococcus faecium*
385	mvaDEfaecium_1_1	*Enterococcus faecium*
386	mvaEEfaecium_1_1	*Enterococcus faecium*
387	mvaK1Efaecium_1_1	*Enterococcus faecium*
388	mvaK2Efaecium_1_1	*Enterococcus faecium*
389	mvaSEfaecium_1_1	*Enterococcus faecium*
390	orf3_4Efaeciumb_1_1	*Enterococcus faecium*
391	orf6_7Efaecium_1_1	*Enterococcus faecium*
392	orf7_8Efaecium_1_1	*Enterococcus faecium*
393	orf9_10Efaecium_1_1	*Enterococcus faecium*
394	entA_entI_1_1	*Enterococcus faecium*
395	entD_1_1	*Enterococcus faecium*
396	entR_1_1	*Enterococcus faecium*
397	oep_1_1	*Enterococcus faecium*
398	sagA_1_2	*Enterococcus faecium*
399	atsA_1_1	*Klebsiella pneumoniae*
400	atsB_1_1	*Klebsiella pneumoniae*
401	budC_1_1	*Klebsiella pneumoniae*
402	citA_1_1	*Klebsiella pneumoniae*
403	citW_1_1	*Klebsiella pneumoniae*
404	citX_1_1	*Klebsiella pneumoniae*
405	dalD_1_1	*Klebsiella pneumoniae*
406	dalK_1_1	*Klebsiella pneumoniae*
407	dalT_1_1	*Klebsiella pneumoniae*
408	acoA_1_1	*Klebsiella pneumoniae*
409	acoB_1_1	*Klebsiella pneumoniae*
410	acoC_1_1	*Klebsiella pneumoniae*
411	ahlK_1_1	*Klebsiella pneumoniae*

SEQ ID NO	Probe name	Template source
412	fimK_1_1	*Klebsiella pneumoniae*
413	glfKPN2_1_1	*Klebsiella pneumoniae*
414	ltrA_1_1	*Klebsiella pneumoniae*
415	mdcC_1_1	*Klebsiella pneumoniae*
416	mdcF_1_1	*Klebsiella pneumoniae*
417	mdcH_1_1	*Klebsiella pneumoniae*
418	mrkA_1_1	*Klebsiella pneumoniae*
419	mtrK_1_1	*Klebsiella pneumoniae*
420	nifF_1_1	*Klebsiella pneumoniae*
421	nifK_1_1	*Klebsiella pneumoniae*
422	nifN_1_1	*Klebsiella pneumoniae*
423	tyrP_1_1	*Klebsiella pneumoniae*
424	ureA_1_1	*Klebsiella pneumoniae*
425	wbbO_1_1	*Klebsiella pneumoniae*
426	wza_1_1	*Klebsiella pneumoniae*
427	wzb_1_1	*Klebsiella pneumoniae*
428	wzmKPN2_1_1	*Klebsiella pneumoniae*
429	wztKPN2_1_1	*Klebsiella pneumoniae*
430	yojH_1_1	*Klebsiella pneumoniae*
431	liac_1_1	*Klebsiella pneumoniae*
432	cim_1_1	*Klebsiella pneumoniae*
433	aldA_1_1	*Klebsiella pneumoniae*
434	aldA_2_1	*Klebsiella pneumoniae*
435	hemly_1_1	*Klebsiella pneumoniae*
436	pSL017_1_1	*Klebsiella pneumoniae*
437	pSL020_1_1	*Klebsiella pneumoniae*
438	rcsA_1_1	*Klebsiella pneumoniae*
439	rmlC_1_1	*Klebsiella pneumoniae*
440	rmlD_1_1	*Klebsiella pneumoniae*
441	waaG_1_1	*Klebsiella pneumoniae*
442	wbbD_1_1	*Klebsiella pneumoniae*
443	wbbM_1_1	*Klebsiella pneumoniae*
444	wbbN_1_1	*Klebsiella pneumoniae*
445	wbdA_1_1	*Klebsiella pneumoniae*
446	wbdC_1_1	*Klebsiella pneumoniae*
447	wztKpn_1_1	*Klebsiella pneumoniae*
448	yibD_1_1	*Klebsiella pneumoniae*
449	cymA_1_1	*Klebsiella oxytoca*
450	cymD_1_1	*Klebsiella oxytoca*
451	cymE_1_1	*Klebsiella oxytoca*
452	cymH_1_1	*Klebsiella oxytoca*
453	cymI_1_1	*Klebsiella oxytoca*
454	cymJ_1_1	*Klebsiella oxytoca*
455	ddrA_1_1	*Klebsiella oxytoca*
456	fdt-1_1_1	*Klebsiella oxytoca*
457	fdt-2_1_1	*Klebsiella oxytoca*

SEQ ID NO	Probe name	Template source
458	fdt-3_1_1	*Klebsiella oxytoca*
459	gatY_1_1	*Klebsiella oxytoca*
460	hydH_1_1	*Klebsiella oxytoca*
461	masA_1_1	*Klebsiella oxytoca*
462	nasA_1_1	*Klebsiella oxytoca*
463	nasE_1_1	*Klebsiella oxytoca*
464	nasF_1_1	*Klebsiella oxytoca*
465	pehX_1_1	*Klebsiella oxytoca*
466	pelX_1_1	*Klebsiella oxytoca*
467	tagH_1_1	*Klebsiella oxytoca*
468	tagK_1_1	*Klebsiella oxytoca*
469	tagT_1_1	*Klebsiella oxytoca*
470	glpR_1_1	*Pseudomonas aeruginosa*
471	lasRb_1_1	*Pseudomonas aeruginosa*
472	OrfX_1_1	*Pseudomonas aeruginosa*
473	pa0260_1_1	*Pseudomonas aeruginosa*
474	pa0572_1_1	*Pseudomonas aeruginosa*
475	pa0625_1_1	*Pseudomonas aeruginosa*
476	pa0636_1_1	*Pseudomonas aeruginosa*
477	pa1046_1_1	*Pseudomonas aeruginosa*
478	pa1069_1_1	*Pseudomonas aeruginosa*
479	pa1846_1_1	*Pseudomonas aeruginosa*
480	pa3866_1_1	*Pseudomonas aeruginosa*
481	pa4082_1_1	*Pseudomonas aeruginosa*
482	pilAp_1_1	*Pseudomonas aeruginosa*
483	PilAp2_1_1	*Pseudomonas aeruginosa*
484	pilC_1_1	*Pseudomonas aeruginosa*
485	PstP_1_1	*Pseudomonas aeruginosa*
486	purK_1_1	*Pseudomonas aeruginosa*
487	uvrDII_1_1	*Pseudomonas aeruginosa*
488	vsmI_1_1	*Pseudomonas aeruginosa*
489	vsmR_1_2	*Pseudomonas aeruginosa*
490	xcpX_1_1	*Pseudomonas aeruginosa*
491	aprA_1_1	*Pseudomonas aeruginosa*
492	aprE_1_1	*Pseudomonas aeruginosa*
493	ctx_1_2	*Pseudomonas aeruginosa*
494	algB_1_1	*Pseudomonas aeruginosa*
495	algN_1_1	*Pseudomonas aeruginosa*
496	algR_1_1	*Pseudomonas aeruginosa*
497	ExoS_1_1	*Pseudomonas aeruginosa*
498	fpvA_1_1	*Pseudomonas aeruginosa*
499	lasRa_1_1	*Pseudomonas aeruginosa*
500	lipA_1_1	*Pseudomonas aeruginosa*
501	lipH_1_1	*Pseudomonas aeruginosa*
502	Orf159_1_2	*Pseudomonas aeruginosa*
503	Orf252_1_1	*Pseudomonas aeruginosa*

SEQ ID NO	Probe name	Template source
504	pchG_1_1	*Pseudomonas aeruginosa*
505	PhzA_1_1	*Pseudomonas aeruginosa*
506	PhzB_1_1	*Pseudomonas aeruginosa*
507	PLC_1_1	*Pseudomonas aeruginosa*
508	plcN_1_1	*Pseudomonas aeruginosa*
509	plcR_1_1	*Pseudomonas aeruginosa*
510	pvdD_1_1	*Pseudomonas aeruginosa*
511	pvdF_1_2	*Pseudomonas aeruginosa*
512	pyocinS1_1_1	*Pseudomonas aeruginosa*
513	pyocinS1im_1_1	*Pseudomonas aeruginosa*
514	pyocinS2_1_1	*Pseudomonas aeruginosa*
515	pys2_1_1	*Pseudomonas aeruginosa*
516	pys2_2_1	*Pseudomonas aeruginosa*
517	rbf303_1_1	*Pseudomonas aeruginosa*
518	rhlA_1_1	*Pseudomonas aeruginosa*
519	rhlB_1_1	*Pseudomonas aeruginosa*
520	rhlR_1_1	*Pseudomonas aeruginosa*
521	TnAP41_1_2	*Pseudomonas aeruginosa*
522	toxA_1_1	*Pseudomonas aeruginosa*
523	cap1EStrpneu_1_1	*Streptococcus pneumoniae*
524	cap1FStrpneu_1_1	*Streptococcus pneumoniae*
525	cap1GStrpneu_1_1	*Streptococcus pneumoniae*
526	cap3AStrpneu_1_1	*Streptococcus pneumoniae*
527	cap3BStrpneu_1_1	*Streptococcus pneumoniae*
528	celAStrpneu_1_1	*Streptococcus pneumoniae*
529	celBStrpneu_1_1	*Streptococcus pneumoniae*
530	cglAStrpneu_1_1	*Streptococcus pneumoniae*
531	cglBStrpneu_1_1	*Streptococcus pneumoniae*
532	cglCStrpneu_1_1	*Streptococcus pneumoniae*
533	cglDStrpneu_1_1	*Streptococcus pneumoniae*
534	cinA_1_1	*Streptococcus pneumoniae*
535	cps14EStrpneum_1_1	*Streptococcus pneumoniae*
536	cps14FStrpneum_1_1	*Streptococcus pneumoniae*
537	cps14GStrpneum_1_1	*Streptococcus pneumoniae*
538	cps14HStrpneum_1_1	*Streptococcus pneumoniae*
539	cps19aHStrpneum_1_1	*Streptococcus pneumoniae*
540	cps19aIStrpneum_1_1	*Streptococcus pneumoniae*
541	cps19aKStrpneum_1_1	*Streptococcus pneumoniae*
542	cps19fGStrpneum_1_1	*Streptococcus pneumoniae*
543	cps23fGStrpneum_1_1	*Streptococcus pneumoniae*
544	dexB_1_1	*Streptococcus pneumoniae*
545	dinF_1_1	*Streptococcus pneumoniae*
546	1760Strpneu_1_1	*Streptococcus pneumoniae*
547	acyPStrpneu_1_1	*Streptococcus pneumoniae*
548	endAStrpneu_1_1	*Streptococcus pneumoniae*
549	exoAStrpneu_1_1	*Streptococcus pneumoniae*

SEQ ID NO	Probe name	Template source
550	exp72_1_1	*Streptococcus pneumoniae*
551	fnlAStrpneu_1_1	*Streptococcus pneumoniae*
552	fnlBStrpneu_1_1	*Streptococcus pneumoniae*
553	fnlCStrpneu_1_1	*Streptococcus pneumoniae*
554	gct18Strpneum_1_1	*Streptococcus pneumoniae*
555	hexB1_1_1	*Streptococcus pneumoniae*
556	hftsHstrpneu_1_1	*Streptococcus pneumoniae*
557	immunofrag1Strpneu_1_1	*Streptococcus pneumoniae*
558	immunofrag2Strpneu_2_1	*Streptococcus pneumoniae*
559	immunofrag3Strpneu_2_1	*Streptococcus pneumoniae*
560	kdtBStrpneu_1_1	*Streptococcus pneumoniae*
561	lysAStrpneu_1_1	*Streptococcus pneumoniae*
562	pcpBStrpneu_1_1	*Streptococcus pneumoniae*
563	pflCStrpneu_1_1	*Streptococcus pneumoniae*
564	plpA_1_1	*Streptococcus pneumoniae*
565	prtA1Strpneu_1_1	*Streptococcus pneumoniae*
566	pspC1Strpneu_1_1	*Streptococcus pneumoniae*
567	pspC2_1_1	*Streptococcus pneumoniae*
568	purRStrpneu_1_1	*Streptococcus pneumoniae*
569	pyrDAStrpneum_1_1	*Streptococcus pneumoniae*
570	SP0828Strpneu_1_1	*Streptococcus pneumoniae*
571	SP0830Strpneu_1_1	*Streptococcus pneumoniae*
572	SP0833Strpneu_1_1	*Streptococcus pneumoniae*
573	SP0837_38Strpneu_1_1	*Streptococcus pneumoniae*
574	SP0839Strpneu_1_1	*Streptococcus pneumoniae*
575	ugdStrpneu_1_1	*Streptococcus pneumoniae*
576	uncC_1_1	*Streptococcus pneumoniae*
577	vicXStrepneu_1_1	*Streptococcus pneumoniae*
578	wchA6bStrpneum_1_1	*Streptococcus pneumoniae*
579	wci4Strpneum_1_1	*Streptococcus pneumoniae*
580	wciK4Strpneum_1_1	*Streptococcus pneumoniae*
581	wciL4Strpneum_1_1	*Streptococcus pneumoniae*
582	wciN6bStrpneum_1_1	*Streptococcus pneumoniae*
583	wciO6bStrpneum_1_1	*Streptococcus pneumoniae*
584	wciP6bStrpneum_1_1	*Streptococcus pneumoniae*
585	wciY18Strpneum_1_1	*Streptococcus pneumoniae*
586	wzdbStrpneum_1_1	*Streptococcus pneumoniae*
587	wze6bStrpneum_1_1	*Streptococcus pneumoniae*
588	wzy18Strpneum_1_1	*Streptococcus pneumoniae*
589	wzy4Strpneum_1_1	*Streptococcus pneumoniae*
590	wzy6bStrpneum_1_1	*Streptococcus pneumoniae*
591	xpt_1_1	*Streptococcus pneumoniae*
592	igaStrpneu_1_1	*Streptococcus pneumoniae*
593	lytA_1_1	*Streptococcus pneumoniae*
594	nanA_1_1	*Streptococcus pneumoniae*
595	nanBStrpneu_1_1	*Streptococcus pneumoniae*

SEQ ID NO	Probe name	Template source
596	pcpCStrpneu_1_1	*Streptococcus pneumoniae*
597	ply_1_1	*Streptococcus pneumoniae*
598	prtAStrpneu_1_1	*Streptococcus pneumoniae*
599	pspA_1_2	*Streptococcus pneumoniae*
600	SP0834Strpneu_1_1	*Streptococcus pneumoniae*
601	SP0834Strpneu_1_2	*Streptococcus pneumoniae*
602	sphtraStrpneu_1_1	*Streptococcus pneumoniae*
603	wciJStrpneu_1_1	*Streptococcus pneumoniae*
604	wziyStrpneu_1_1	*Streptococcus pneumoniae*
605	wzxStrpneu_1_1	*Streptococcus pneumoniae*
606	cpsA1Strgal_1_1	*Streptococcus agalactiae*
607	cpsB1Strgal_1_1	*Streptococcus agalactiae*
608	cpsC1Strgal_1_1	*Streptococcus agalactiae*
609	cpsD1Strgal_1_1	*Streptococcus agalactiae*
610	cpsE1Strgal_1_1	*Streptococcus agalactiae*
611	cpsG1Strgal_1_1	*Streptococcus agalactiae*
612	cpsIStragal_1_1	*Streptococcus agalactiae*
613	cpsJStragal_1_1	*Streptococcus agalactiae*
614	cpsKStragal_1_1	*Streptococcus agalactiae*
615	cpsMStragal_1_1	*Streptococcus agalactiae*
616	cpsYStragal_1_1	*Streptococcus agalactiae*
617	cpsYStragal_2_1	*Streptococcus agalactiae*
618	cylBStraga_1_1	*Streptococcus agalactiae*
619	cylEStraga_1_1	*Streptococcus agalactiae*
620	cylFStraga_1_1	*Streptococcus agalactiae*
621	cylHStraga_1_1	*Streptococcus agalactiae*
622	cylIStraga_1_1	*Streptococcus agalactiae*
623	cylJStraga_1_1	*Streptococcus agalactiae*
624	cylKStraga_1_1	*Streptococcus agalactiae*
625	0487Straga_1_1	*Streptococcus agalactiae*
626	0488Straga_1_1	*Streptococcus agalactiae*
627	0493Straga_1_1	*Streptococcus agalactiae*
628	0495Straga_1_1	*Streptococcus agalactiae*
629	0498Straga_1_1	*Streptococcus agalactiae*
630	0500Straga_1_1	*Streptococcus agalactiae*
631	0502Straga_1_1	*Streptococcus agalactiae*
632	0504Straga_1_1	*Streptococcus agalactiae*
633	folDStraga_1_1	*Streptococcus agalactiae*
634	neuA1Strgal_1_1	*Streptococcus agalactiae*
635	neuB1Strgal_1_1	*Streptococcus agalactiae*
636	neuC1Strgal_1_1	*Streptococcus agalactiae*
637	neuD1Strgal_1_1	*Streptococcus agalactiae*
638	recNStraga_1_1	*Streptococcus agalactiae*
639	ileSStraga_1_1	*Streptococcus agalactiae*
640	CAMPfactor_1_1	*Streptococcus agalactiae*
641	CAMPfactor_2_1	*Streptococcus agalactiae*

SEQ ID NO	Probe name	Template source
642	0499Straga_1_1	*Streptococcus agalactiae*
643	hylStragal_1_1	*Streptococcus agalactiae*
644	lipStragal_1_1	*Streptococcus agalactiae*
645	cyclStrpyog_1_1	*Streptococcus pyogenes*
646	fah_rph_hlo_Strpyog_1_1	*Streptococcus pyogenes*
647	int_1_1	*Streptococcus pyogenes*
648	int315.5_1_1	*Streptococcus pyogenes*
649	murEStrpyog_1_1	*Streptococcus pyogenes*
650	oppA_1_1	*Streptococcus pyogenes*
651	oppCStrpyog_1_1	*Streptococcus pyogenes*
652	oppD_1_1	*Streptococcus pyogenes*
653	SPy0382Strpyog_1_1	*Streptococcus pyogenes*
654	SPy0390Strpyog_1_1	*Streptococcus pyogenes*
655	SpyM3_1351_1_1	*Streptococcus pyogenes*
656	vicXStrpyog_1_1	*Streptococcus pyogenes*
657	DNaseIStrpyog_1_1	*Streptococcus pyogenes*
658	fba2Strpyog_1_1	*Streptococcus pyogenes*
659	fhuAStrpyog_1_1	*Streptococcus pyogenes*
660	fhuB1Strpyog_1_1	*Streptococcus pyogenes*
661	fhuDStrpyog_1_1	*Streptococcus pyogenes*
662	fhuGStrpyog_1_1	*Streptococcus pyogenes*
663	hylA_1_1	*Streptococcus pyogenes*
664	hylP_1_1	*Streptococcus pyogenes*
665	hylp2_1_1	*Streptococcus pyogenes*
666	oppB_1_1	*Streptococcus pyogenes*
667	ropB_1_1	*Streptococcus pyogenes*
668	scpAStrpyog_1_1	*Streptococcus pyogenes*
669	sloStrpyog_1_1	*Streptococcus pyogenes*
670	smez-4Strpyog_1_1	*Streptococcus pyogenes*
671	sof_1_1	*Streptococcus pyogenes*
672	sof_2_1	*Streptococcus pyogenes*
673	speA_1_1	*Streptococcus pyogenes*
674	speB2Strpyog_1_1	*Streptococcus pyogenes*
675	speCStrpyog_1_1	*Streptococcus pyogenes*
676	speJStrpyog_1_1	*Streptococcus pyogenes*
677	srtBStrpyog_1_1	*Streptococcus pyogenes*
678	srtCStrpyog_1_1	*Streptococcus pyogenes*
679	srtEStrpyog_1_1	*Streptococcus pyogenes*
680	srtFStrpyog_1_1	*Streptococcus pyogenes*
681	srtGStrpyog_1_1	*Streptococcus pyogenes*
682	srtIStrpyog_1_1	*Streptococcus pyogenes*
683	srtKStrpyog_1_1	*Streptococcus pyogenes*
684	srtRStrpyog_1_1	*Streptococcus pyogenes*
685	srtTStrpyog_1_1	*Streptococcus pyogenes*
686	vicKStrpyog_1_1	*Streptococcus pyogenes*
687	573Stprmut_1_1	*Streptococcus viridans*

SEQ ID NO	Probe name	Template source
688	580SStprmut_1_1	*Streptococcus viridans*
689	581_582SStprmut_1_1	*Streptococcus viridans*
690	584SStprmut_1_1	*Streptococcus viridans*
691	dltAStrmut_1_1	*Streptococcus viridans*
692	dltBStrmut_1_1	*Streptococcus viridans*
693	dltCppx1Strmut_1_1	*Streptococcus viridans*
694	dltDStrmut_1_1	*Streptococcus viridans*
695	lichStrbov_1_1	*Streptococcus viridans*
696	lytRStprmut_1_1	*Streptococcus viridans*
697	lytSStprmut_1_1	*Streptococcus viridans*
698	pepQStrrmut_1_1	*Streptococcus viridans*
699	pflCStrmut_1_1	*Streptococcus viridans*
700	recNStprmut_1_1	*Streptococcus viridans*
701	ytqBStrmut_1_1	*Streptococcus viridans*
702	hlyXStrmut_1_1	*Streptococcus viridans*
703	igaStrmitis_1_1	*Streptococcus viridans*
704	igaStrsanguis_1_1	*Streptococcus viridans*
705	perMStrmut_1_1	*Streptococcus viridans*
706	atfA_1_1	*Proteus mirabilis*
707	atfB_1_1	*Proteus mirabilis*
708	atfC_1_1	*Proteus mirabilis*
709	ccmPrmi1_1_1	*Proteus mirabilis*
710	cyaPrmi_1_1	*Proteus mirabilis*
711	aad_1_1	*Proteus mirabilis*
712	flfB_1_1	*Proteus mirabilis*
713	flfD_1_1	*Proteus mirabilis*
714	flfN_1_1	*Proteus mirabilis*
715	flhD_1_1	*Proteus mirabilis*
716	floA_1_1	*Proteus mirabilis*
717	ftsK_1_1	*Proteus mirabilis*
718	gstB_1_1	*Proteus mirabilis*
719	hemCPrmi_1_1	*Proteus mirabilis*
720	hemDPrmi_1_1	*Proteus mirabilis*
721	hev_1_1	*Proteus mirabilis*
722	katA_1_1	*Proteus mirabilis*
723	lpp1_1_1	*Proteus mirabilis*
724	menE_1_1	*Proteus mirabilis*
725	mfd_1_1	*Proteus mirabilis*
726	nrpA_1_1	*Proteus mirabilis*
727	nrpB_1_1	*Proteus mirabilis*
728	nrpG_1_1	*Proteus mirabilis*
729	nrpS_1_1	*Proteus mirabilis*
730	nrpT_1_1	*Proteus mirabilis*
731	nrpU_1_1	*Proteus mirabilis*
732	pat_1_1	*Proteus mirabilis*
733	pmfA_1_1	*Proteus mirabilis*

SEQ ID NO	Probe name	Template source
734	pmfC_1_1	*Proteus mirabilis*
735	pmfE_1_1	*Proteus mirabilis*
736	ppaA_1_1	*Proteus mirabilis*
737	rsbA_1_1	*Proteus mirabilis*
738	rsbC_1_1	*Proteus mirabilis*
739	speB_1_1	*Proteus mirabilis*
740	stmA_1_1	*Proteus mirabilis*
741	stmB_1_1	*Proteus mirabilis*
742	terA_1_1	*Proteus mirabilis*
743	terD_1_1	*Proteus mirabilis*
744	umoA_1_1	*Proteus mirabilis*
745	umoB_1_1	*Proteus mirabilis*
746	umoC_1_1	*Proteus mirabilis*
747	ureR_1_1	*Proteus mirabilis*
748	xerC_1_1	*Proteus mirabilis*
749	ygbA_1_1	*Proteus mirabilis*
750	flaA_1_1	*Proteus mirabilis*
751	flaD_1_1	*Proteus mirabilis*
752	fliA_1_1	*Proteus mirabilis*
753	hpmA_1_1	*Proteus mirabilis*
754	hpmB_1_1	*Proteus mirabilis*
755	lpsPrmi_1_1	*Proteus mirabilis*
756	mrpA_1_1	*Proteus mirabilis*
757	mrpB_1_1	*Proteus mirabilis*
758	mrpC_1_1	*Proteus mirabilis*
759	mrpD_1_1	*Proteus mirabilis*
760	mrpE_1_1	*Proteus mirabilis*
761	mrpF_1_1	*Proteus mirabilis*
762	mrpG_1_1	*Proteus mirabilis*
763	mrpH_1_1	*Proteus mirabilis*
764	mrpI_1_1	*Proteus mirabilis*
765	mrpJ_1_1	*Proteus mirabilis*
766	patA_1_1	*Proteus mirabilis*
767	putA_1_1	*Proteus mirabilis*
768	uca_1_1	*Proteus mirabilis*
769	ureDPrmi_1_1	*Proteus mirabilis*
770	ureEPrmi_1_1	*Proteus mirabilis*
771	ureFPrmi_1_1	*Proteus mirabilis*
772	zapA_1_1	*Proteus mirabilis*
773	zapB_1_1	*Proteus mirabilis*
774	zapD_1_1	*Proteus mirabilis*
775	zapE_1_1	*Proteus mirabilis*
776	envZPrvu_1_1	*Proteus vulgaris*
777	frdC_1_1	*Proteus vulgaris*
778	frdD_1_1	*Proteus vulgaris*
779	infBPrvu_1_1	*Proteus vulgaris*

SEQ ID NO	Probe name	Template source
780	lad_1_1	*Proteus vulgaris*
781	tna2_1_1	*Proteus vulgaris*
782	end_1_1	*Proteus vulgaris*
783	pqrA_1_1	*Proteus vulgaris*
784	urg_1_1	*Proteus vulgaris*
785	blaIMP-7_1_1	*Pseudomonas aeruginosa*
786	mecISepid_1_1	*Staphylococcus epidermidis*
787	blaOXA-10_1_2	*Pseudomonas aeruginosa*
788	blaB_1_1	*Proteus vulgaris*
789	ampC_1_1	*Klebsiella oxytoca*
790	I-blaR_1_1	*Staphylococcus aureus*
791	blaOXA-32_1_1	*Pseudomonas aeruginosa*
792	bla-CTX-M-22_1_1	*Klebsiella pneumoniae*
793	pbp2aStrpneu_1_1	*Streptococcus pneumoniae*
794	blaSHV-1_1_1	*Klebsiella pneumoniae*
795	blaOXA-2_1_1	*Salmonella typhimurium*
796	blaRShaemolyt_1_1	*Staphylococcus haemolyticus*
797	blaIMP-7_1_2	*Pseudomonas aeruginosa*
798	I-mecR_1_1	*Staphylococcus aureus*
799	blaOXY_1_1	*Klebsiella oxytoca*
800	dacCStrpyog_1_1	*Streptococcus pyogenes*
801	femA_1_1	*Staphylococcus aureus*
802	mecA_1_1	*Staphylococcus aureus*
803	blaIShaemolyt_1_1	*Staphylococcus haemolyticus*
804	blavim_1_1	*Pseudomonas aeruginosa*
805	pbp2b_1_1	*Streptococcus pneumoniae*
806	pbp2primeSepid_1_1	*Staphylococcus epidermidis*
807	pbp2x_1_1	*Streptococcus pneumoniae*
808	pbp3Saureuc_1_1	*Staphylococcus aureus*
809	pbp4_1_1	*Enterococcus faecalis*
810	pbp5Efaecium_1_1	*Enterococcus faecium*
811	pbpC_1_1	*Enterococcus faecalis*
812	I-mecI_1_1	*Staphylococcus aureus*
813	pbp1a_1_1	*Streptococcus pneumoniae*
814	I-blaI_1_1	*Staphylococcus aureus*
815	blaTEM-106_1_1	*Escherichia coli*
816	blaOXY-KLOX_1_1	*Klebsiella oxytoca*
817	ftsWEF_1_1	*Enterococcus faecium*
818	fmhB_1_1	*Staphylococcus aureus*
819	cumA_1_1	*Proteus vulgaris*
820	femBShaemolyt_1_1	*Staphylococcus haemolyticus*
821	blaPER-1_1_1	*Pseudomonas aeruginosa*
822	bla_FOX-3_1_1	*Klebsiella oxytoca*
823	blaA_1_1	*Proteus vulgaris*
824	psrb_1_1	*Enterococcus faecium*
825	fmhA_1_1	*Staphylococcus aureus*

SEQ ID NO	Probe name	Template source
826	mecR1Sepid_1_1	*Staphylococcus epidermidis*
827	blaZ_1_1	*Staphylococcus aureus*
828	blaOXA-1_1_1	*Plasmid RGN238*
829	fox-6_1_1	*Klebsiella pneumoniae*
830	blaPrmi_1_1	*Proteus mirabilis*
831	aacA_aphDStwar_1_1	*Staphylococcus warneri*
832	aacC1_1_2	*Pseudomonas aeruginosa*
833	aacC2_1_1	*Escherichia coli*
834	strB_1_1	*Escherichia coli*
835	aadA_1_1	*Enterococcus faecalis*
836	aadB_1_2	*Escherichia coli*
837	aadD_1_1	*Staphylococcus aureus*
838	aacA4_1_2	*Pseudomonas aeruginosa*
839	strA_1_1	*Escherichia coli*
840	aph-A3_1_1	*Staphylococcus aureus*
841	aacC1_1_1	*Pseudomonas aeruginosa*
842	aacA4_1_1	*Pseudomonas aeruginosa*
843	aacA-aphD_1_1	*Staphylococcus aureus*
844	I-spc_1_1	*Staphylococcus aureus*
845	aphA3_1_1	*synthetic construct*
846	ermC_1_1	*Staphylococcus aureus*
847	linB_1_1	*Enterococcus faecium*
848	satSA_1_1	*Staphylococcus aureus*
849	mdrSA_1_1	*Staphylococcus aureus*
850	I-linA_1_1	*Staphylococcus aureus*
851	ermB_1_2	*Staphylococcus aureus*
852	ermA_1_1	*Staphylococcus aureus*
853	satA_1_1	*Enterococcus faecium*
854	msrA_1_1	*Staphylococcus aureus*
855	mphBM_1_1	*Staphylococcus aureus*
856	mefA_1_1	*Streptococcus pyogenes*
857	mrx_1_1	*Escherichia coli*
858	dfrStrpneu_1_1	*Streptococcus pneumoniae*
859	dfrA_1_1	*Staphylococcus aureus*
860	cmlA5_1_1	*Escherichia coli*
861	catEfaecium_1_1	*Enterococcus faecium*
862	cat_1_1	*Staphylococcus aureus*
863	tetAJ_1_1	*Proteus mirabilis*
864	tetL_1_1	*Enterococcus faecalis*
865	tetM_1_1	*Enterococcus faecalis*
866	vanH(tn)_1_1	*Enterococcus faecium*
867	vanA_1_1	*Enterococcus faecium*
868	vanHB2_1_1	*Enterococcus faecium*
869	vanR_1_1	*Enterococcus faecium*
870	vanRB2_1_1	*Enterococcus faecium*
871	vanS(tn)_1_1	*Enterococcus faecium*

SEQ ID NO	Probe name	Template source
872	vanSB2_1_1	*Enterococcus faecium*
873	vanWB2_1_1	*Enterococcus faecium*
874	ddl_1_1	*Enterococcus faecalis*
875	ble_1_1	*Staphylococcus aureus*
876	vanXB2_1_1	*Enterococcus faecium*
877	vanY(tn)_1_1	*Enterococcus faecium*
878	vanYB2_1_1	*Enterococcus faecium*
879	vanB_1_1	*Enterococcus faecalis*
880	vanZ(tn)_1_1	*Enterococcus faecium*
881	vanC-2_1_1	*Enterococcus flavescens*
882	vanX(tn)_1_1	*Enterococcus faecium*
883	acrB_1_1	*Proteus mirabilis*
884	mexB_1_2	*Pseudomonas aeruginosa*
885	I-qacA_1_1	*Staphylococcus aureus*
886	sulI_1_1	*Escherichia coli*
887	sul_1_1	*Escherichia coli*
888	cadBStalugd_1_1	*Staphylococcus lugdunensis*
889	mexA_1_1	*Pseudomonas aeruginosa*
890	acrR_1_1	*Proteus mirabilis*
891	emeA_1_1	*Enterococcus faecalis*
892	acrA_1_1	*Proteus mirabilis*
893	rtn_1_1	*Proteus vulgaris*
894	abcXStrpmut_1_1	*Streptococcus mutans*
895	qacEdelta1_1_1	*Escherichia coli*
896	elkT-abcA_1_1	*Staphylococcus aureus*
897	I-cadA_1_1	*Staphylococcus aureus*
898	albA_1_1	*Klebsiella oxytoca*
899	wzm_1_1	*Klebsiella pneumoniae*
900	msrCb_1_1	*Enterococcus faecium*
901	nov_1_1	*Escherichia coli*
902	wzt_1_1	*Klebsiella pneumoniae*
903	wbbl_1_1	*Klebsiella pneumoniae*
904	norA23_1_1	*Staphylococcus aureus*
905	mexR_1_1	*Pseudomonas aeruginosa*
906	arr2_1_1	*Escherichia coli*
907	mreA_1_1	*Staphylococcus aureus*
908	I-cadC_1_1	*Staphylococcus aureus*
909	uvrA_1_1	*Enterococcus faecalis*
910	CRD2_1_1	*Candida albicans*
911	CDR1_1_1	*Candida albicans*
912	CDR1_2_1	*Candida albicans*
913	MET3_1_1	*Candida albicans*
914	FET3_1_1	*Candida albicans*
915	FTR2_1_1	*Candida albicans*
916	MDR1-7_1_1	*Candida albicans*
917	ERG11_1_1	*Candida albicans*

SEQ ID NO	Probe name	Template source
918	SEC20_1_1	*Candida albicans*
919	rbcL_1_1	*Glycine max*
920	LDHA(hu)_1_1	*Homo sapiens*
921	GAPD(hu)_1_1	*Homo sapiens*
922	b-Act(hu)_1_1	*Homo sapiens*
923	ARHGDIA(hu)_1_1	*Homo sapiens*
924	PGK1(hu)_1_1	*Homo sapiens*
925	rbcL_1_2	*Glycine max*
926	16SPa_1_1	*Pseudomonas aeruginosa*
927	23SEfaecium_2_1	*Enterococcus faecium*
928	16SStrepyog_1_1	*Streptococcus pyogenes*
929	16SStrepneu_1_1	*Streptococcus pneumoniae*
930	16SStrepagalactiae_1_1	*Streptococcus agalactiae*
931	16SEfaecium_1_1	*Enterococcus faecium*
932	16SEfaecium_2_1	*Enterococcus faecium*
933	16SRNAEf_2_1	*Enterococcus faecalis*
934	16SKpn_1_1	*Klebsiella pneumoniae*
935	16SSa_3_1	*Staphylococcus aureus*
936	16SRNAEf_1_1	*Enterococcus faecalis*
937	16SShominis_1_1	*Staphylococcus hominis*
938	16SShaemolyt_1_1	*Staphylococcus haemolyticus*
939	23SEfaecium_1_1	*Enterococcus faecium*
940	16SrRNAPrmi_1_1	*Proteus mirabilis*
941	16SrRNAPrvu1_1_1	*Proteus vulgaris*
942	16SSa_1_1	*Staphylococcus aureus*
943	16SKlox_1_1	*Klebsiella oxytoca*
944	p53_1_1	*Mus musculus*
945	0135mihck_1_1	*Dictyostelium discoideum*
946	FAN_1_1	*Mus musculus*
947	0270cap_1_1	*Dictyostelium discoideum*
2842	16SStrepdysgal_1_1	*Streptococcus dysgalactiae*
2843	carO_1_1	*Acinetobacter baumannii*
2844	gacS_1_1	*Acinetobacter baumannii*
2845	dhbA_1_1	*Acinetobacter baumannii*
2846	dhbB_1_1	*Acinetobacter baumannii*
2847	sid_1_1	*Acinetobacter baumannii*
2848	csuD_1_1	*Acinetobacter baumannii*
2849	csuC_1_1	*Acinetobacter baumannii*
2850	tnp-ACIBA_1_1	*Acinetobacter baumannii*
2851	waaA-ACIBA_1_1	*Acinetobacter baumannii*
2852	csuB_1_1	*Acinetobacter baumannii*
2853	csuA_B_1_1	*Acinetobacter baumannii*
2854	csuA_1_1	*Acinetobacter baumannii*
2855	put1_1_1	*Acinetobacter baumannii*
2856	por_1_1	*Acinetobacter baumannii*
2857	abc_1_1	*Acinetobacter baumannii*

SEQ ID NO	Probe name	Template source
2858	furACIBA_1_1	*Acinetobacter baumannii*
2859	dec_1_1	*Acinetobacter baumannii*
2860	cysI_1_1	*Acinetobacter baumannii*
2861	trpE_1_1	*Acinetobacter baumannii*
2862	put3_1_1	*Acinetobacter baumannii*
2863	ompA-ACIBA_1_1	*Acinetobacter baumannii*
2864	aacA4ENCL_1_1	*Enterobacter cloacae*
2865	AdeR-ACIBA_1_1	*Acinetobacter baumannii*
2866	adeA-ACIBA_1_1	*Acinetobacter baumannii*
2867	aac(6p)-Ib7_1_1	*Enterobacter cloacae*
2868	adeB-ACIBA_1_1	*Acinetobacter baumannii*
2869	adeC-ACIBA_1_1	*Acinetobacter baumannii*
2870	AdeS-ACIBA_1_1	*Acinetobacter baumannii*
2871	blaL2_1_1	*Stenotrophomonas maltophilia*
2872	blaMIR-3_1_1	*Enterobacter cloacae*
2873	ampR_1_1	*Enterobacter cloacae*
2874	ampC-ENCL_1_1	*Enterobacter cloacae*
2875	blaL1_1_1	*Stenotrophomonas maltophilia*
2876	asr_1_1	*Enterobacter cloacae*
2877	lacZ_1_1	*Enterobacter cloacae*
2878	ehuS_1_1	*Enterobacter cloacae*
2879	ehuV_1_1	*Enterobacter cloacae*
2880	slyA_1_1	*Enterobacter cloacae*
2881	ORF165_1_1	*Enterobacter cloacae*
2882	ehuU_1_1	*Enterobacter cloacae*
2883	ehuT_1_1	*Enterobacter cloacae*
2884	ORF295_1_1	*Enterobacter cloacae*
2885	ehuA_1_1	*Enterobacter cloacae*
2886	ORF400_1_1	*Enterobacter cloacae*
2887	H+ATPase_1_1	*Enterococcus faecium*
2888	sulII_1_1	*Acinetobacter baumannii*
2889	smeE_1_1	*Stenotrophomonas maltophilia*
2890	eE_1_1	*Stenotrophomonas maltophilia*
2891	StmPr1_1_1	*Stenotrophomonas maltophilia*
2892	eD_2_1	*Stenotrophomonas maltophilia*
2893	ppi_1_1	*Stenotrophomonas maltophilia*
2894	pmp-STEMA_1_1	*Stenotrophomonas maltophilia*
2895	pam_1_1	*Stenotrophomonas maltophilia*
2896	ORF4-STEMA_1_1	*Stenotrophomonas maltophilia*
2897	ORF2-STEMA_1_1	*Stenotrophomonas maltophilia*
2898	et_1_1	*Stenotrophomonas maltophilia*
2899	eF_1_1	*Stenotrophomonas maltophilia*
2900	StmPr2_1_1	*Stenotrophomonas maltophilia*
2901	smeF4494_1_1	*Stenotrophomonas maltophilia*
2902	coa_3_1	*Staphylococcus aureus*
2903	coa_2_2	*Staphylococcus aureus*

SEQ ID NO	Probe name	Template source
2904	fasCAXStrdysg_1_1	*Streptococcus dysgalactiae*
2905	sloStrep_1_1	*Streptococcus dysgalactiae*
2906	ydhK_1_1	*Staphylococcus hominis*
2907	tetA-ACIBA_1_1	*Acinetobacter baumannii*
2908	tetR-ACIBA_1_1	*Acinetobacter baumannii*

b) primer sequences

SEQ ID NO	Probe name	Direction
948	cataSaur_1_1	F(orward)
949	cataSaur_1_1	R(everse)
950	cataSaur_1_2	F
951	cataSaur_1_2	R
952	clfA_1_1	F
953	clfA_1_1	R
954	clfB_1_1	F
955	clfB_1_1	R
956	coa_1_1	F
957	coa_1_1	R
958	coa_1_2	F
959	coa_1_2	R
960	I-clpC_1_1	F
961	I-clpC_1_1	R
962	I-clpP_1_1	F
963	I-clpP_1_1	R
964	I-ctaA_1_1	F
965	I-ctaA_1_1	R
966	I-ctsR_1_1	F
967	I-ctsR_1_1	R
968	I-dltA_1_1	F
969	I-dltA_1_1	R
970	I-dltB_1_1	F
971	I-dltB_1_1	R
972	I-dltC_1_1	F
973	I-dltC_1_1	R
974	I-dnaK_1_1	F
975	I-dnaK_1_1	R
976	I-elkT_1_1	F
977	I-elkT_1_1	R
978	I-femD_1_1	F
979	I-femD_1_1	R
980	I-glnA_1_1	F
981	I-glnA_1_1	R
982	I-glnR_1_1	F

SEQ ID NO	Probe name	Direction
983	I-glnR_1_1	R
984	I-grlA_1_1	F
985	I-grlA_1_1	R
986	I-grlB_1_1	F
987	I-grlB_1_1	R
988	I-groEL_1_1	F
989	I-groEL_1_1	R
990	I-groES_1_1	F
991	I-groES_1_1	R
992	I-hemA_1_1	F
993	I-hemA_1_1	R
994	I-hemE_1_1	F
995	I-hemE_1_1	R
996	I-hemH_1_1	F
997	I-hemH_1_1	R
998	I-hemL_1_1	F
999	I-hemL_1_1	R
1000	I-hemY_1_1	F
1001	I-hemY_1_1	R
1002	I-lepA_1_1	F
1003	I-lepA_1_1	R
1004	I-lrgA_1_1	F
1005	I-lrgA_1_1	R
1006	I-lrgB_1_1	F
1007	I-lrgB_1_1	R
1008	I-lytM_1_1	F
1009	I-lytM_1_1	R
1010	I-menB_1_1	F
1011	I-menB_1_1	R
1012	I-menD_1_1	F
1013	I-menD_1_1	R
1014	I-menE_1_1	F
1015	I-menE_1_1	R
1016	I-menF_1_1	F
1017	I-menF_1_1	R
1018	I-mreB_1_1	F
1019	I-mreB_1_1	R
1020	I-mreR_1_1	F
1021	I-mreR_1_1	R
1022	I-mutL_1_1	F
1023	I-mutL_1_1	R
1024	I-mutS_1_1	F
1025	I-mutS_1_1	R
1026	I-NAG_1_1	F

SEQ ID NO	Probe name	Direction
1027	I-NAG_1_1	R
1028	I-pbg_1_1	F
1029	I-pbg_1_1	R
1030	I-pbpF_1_1	F
1031	I-pbpF_1_1	R
1032	I-pdhB_1_1	F
1033	I-pdhB_1_1	R
1034	I-pdhC_1_1	F
1035	I-pdhC_1_1	R
1036	I-rsbU_1_1	F
1037	I-rsbU_1_1	R
1038	I-rsbV_1_1	F
1039	I-rsbV_1_1	R
1040	I-rsbW_1_1	F
1041	I-rsbW_1_1	R
1042	I-sgp_1_1	F
1043	I-sgp_1_1	R
1044	I-sirR_1_1	F
1045	I-sirR_1_1	R
1046	I-sodA_1_1	F
1047	I-sodA_1_1	R
1048	I-sodB_1_1	F
1049	I-sodB_1_1	R
1050	I-sstA_1_1	F
1051	I-sstA_1_1	R
1052	I-sstB_1_1	F
1053	I-sstB_1_1	R
1054	I-sstC_1_1	F
1055	I-sstC_1_1	R
1056	I-sstD_1_1	F
1057	I-sstD_1_1	R
1058	I-trx_1_1	F
1059	I-trx_1_1	R
1060	I-yhiN_1_1	F
1061	I-yhiN_1_1	R
1062	epiP-bsaP_1_1	F
1063	epiP-bsaP_1_1	R
1064	geh_1_1	F
1065	geh_1_1	R
1066	gyrA_1_1	F
1067	gyrA_1_1	R
1068	gyrB_1_1	F
1069	gyrB_1_1	R
1070	hemB_1_1	F

SEQ ID NO	Probe name	Direction
1071	hemB_1_1	R
1072	hemC_1_1	F
1073	hemC_1_1	R
1074	hemD_1_1	F
1075	hemD_1_1	R
1076	hemN_1_1	F
1077	hemN_1_1	R
1078	hsdS_1_1	F
1079	hsdS_1_1	R
1080	hsdS_2_1	F
1081	hsdS_2_1	R
1082	lip_1_1	F
1083	lip_1_1	R
1084	menC_1_1	F
1085	menC_1_1	R
1086	murC_1_1	F
1087	murC_1_1	R
1088	nuc_1_1	F
1089	nuc_1_1	R
1090	pdhD_1_1	F
1091	pdhD_1_1	R
1092	rpoB_1_1	F
1093	rpoB_1_1	R
1094	SAV0431_1_1	F
1095	SAV0431_1_1	R
1096	SAV0439_1_1	F
1097	SAV0439_1_1	R
1098	SAV0440_1_1	F
1099	SAV0440_1_1	R
1100	SAV0441_1_1	F
1101	SAV0441_1_1	R
1102	sigB_1_1	F
1103	sigB_1_1	R
1104	spa_1_2	F
1105	spa_1_2	R
1106	sstC_1_1	F
1107	sstC_1_1	R
1108	tag_1_1	F
1109	tag_1_1	R
1110	tyrA_1_1	F
1111	tyrA_1_1	R
1112	I-aroC_1_1	F
1113	I-aroC_1_1	R
1114	I-aroA_1_1	F

SEQ ID NO	Probe name	Direction
1115	I-aroA_1_1	R
1116	I-cna_1_1	F
1117	I-cna_1_1	R
1118	I-ebpS_1_1	F
1119	I-ebpS_1_1	R
1120	I-eno_1_1	F
1121	I-eno_1_1	R
1122	I-fbpA_1_1	F
1123	I-fbpA_1_1	R
1124	I-fib_1_1	F
1125	I-fib_1_1	R
1126	I-fnbB_1_1	F
1127	I-fnbB_1_1	R
1128	I-srtA_1_1	F
1129	I-srtA_1_1	R
1130	I-stpC_1_1	F
1131	I-stpC_1_1	R
1132	I-fnbA_1_1	F
1133	I-fnbA_1_1	R
1134	I-spa_1_1	F
1135	I-spa_1_1	R
1136	I-aroE_1_1	F
1137	I-aroE_1_1	R
1138	I-aroF_1_1	F
1139	I-aroF_1_1	R
1140	I-aroG_1_1	F
1141	I-aroG_1_1	R
1142	I-asp23_1_1	F
1143	I-asp23_1_1	R
1144	I-atl_1_1	F
1145	I-atl_1_1	R
1146	bsaE_1_1	F
1147	bsaE_1_1	R
1148	bsaG_1_1	F
1149	bsaG_1_1	R
1150	cap5h_1_1	F
1151	cap5h_1_1	R
1152	cap5i_1_1	F
1153	cap5i_1_1	R
1154	cap5j_1_1	F
1155	cap5j_1_1	R
1156	cap5k_1_1	F
1157	cap5k_1_1	R
1158	cap8H_1_1	F

SEQ ID NO	Probe name	Direction
1159	cap8H_1_1	R
1160	cap8I_1_1	F
1161	cap8I_1_1	R
1162	cap8J_1_1	F
1163	cap8J_1_1	R
1164	cap8K_1_1	F
1165	cap8K_1_1	R
1166	I-hld_1_1	F
1167	I-hld_1_1	R
1168	I-hysA_1_1	F
1169	I-hysA_1_1	R
1170	I-IgGbg_1_1	F
1171	I-IgGbg_1_1	R
1172	EDIN_1_1	F
1173	EDIN_1_1	R
1174	eta_1_1	F
1175	eta_1_1	R
1176	etb_1_1	F
1177	etb_1_1	R
1178	hglA_1_1	F
1179	hglA_1_1	R
1180	hglA_2_1	F
1181	hglA_2_1	R
1182	hglB_1_1	F
1183	hglB_1_1	R
1184	hglC_2_1	F
1185	hglC_2_1	R
1186	hla_1_1	F
1187	hla_1_1	R
1188	hlb_1_2	F
1189	hlb_1_2	R
1190	lukF_1_1	F
1191	lukF_1_1	R
1192	lukS_1_1	F
1193	lukS_1_1	R
1194	lukS_2_1	F
1195	lukS_2_1	R
1196	NAG_1_1	F
1197	NAG_1_1	R
1198	sak_1_1	F
1199	sak_1_1	R
1200	sea_1_1	F
1201	sea_1_1	R
1202	seb_1_1	F

SEQ ID NO	Probe name	Direction
1203	seb_1_1	R
1204	sec1_1_1	F
1205	sec1_1_1	R
1206	seg_1_1	F
1207	seg_1_1	R
1208	seh_1_1	F
1209	seh_1_1	R
1210	sel_1_1	F
1211	sel_1_1	R
1212	set15_1_1	F
1213	set15_1_1	R
1214	set6_1_1	F
1215	set6_1_1	R
1216	set7_1_1	F
1217	set7_1_1	R
1218	set8_1_1	F
1219	set8_1_1	R
1220	sprV8_1_1	F
1221	sprV8_1_1	R
1222	tst_1_1	F
1223	tst_1_1	R
1224	I-sdrC_1_1	F
1225	I-sdrC_1_1	R
1226	I-sdrD_1_1	F
1227	I-sdrD_1_1	R
1228	I-sdrE_1_1	F
1229	I-sdrE_1_1	R
1230	b1169_1_1	F
1231	b1169_1_1	R
1232	envZ_1_1	F
1233	envZ_1_1	R
1234	fliCb_1_1	F
1235	fliCb_1_1	R
1236	nfrB_1_1	F
1237	nfrB_1_1	R
1238	nlpA_1_1	F
1239	nlpA_1_1	R
1240	pilAe_1_1	F
1241	pilAe_1_1	R
1242	yacH_1_1	F
1243	yacH_1_1	R
1244	yagX_1_1	F
1245	yagX_1_1	R
1246	ycdS_1_1	F

SEQ ID NO	Probe name	Direction
1247	ycdS_1_1	R
1248	yciQ_1_1	F
1249	yciQ_1_1	R
1250	ymcA_1_1	F
1251	ymcA_1_1	R
1252	b1202_1_1	F
1253	b1202_1_1	R
1254	eae_1_1	F
1255	eae_1_1	R
1256	eltB_1_1	F
1257	eltB_1_1	R
1258	escR_1_1	F
1259	escR_1_1	R
1260	escT_1_1	F
1261	escT_1_1	R
1262	escU_1_1	F
1263	escU_1_1	R
1264	espB_1_1	F
1265	espB_1_1	R
1266	fes_1_1	F
1267	fes_1_1	R
1268	fes_2_1	F
1269	fes_2_1	R
1270	fteA_1_1	F
1271	fteA_1_1	R
1272	hlyA_1_1	F
1273	hlyA_1_1	R
1274	hlyB_1_1	F
1275	hlyB_1_1	R
1276	iucA_1_1	F
1277	iucA_1_1	R
1278	iucB_1_1	F
1279	iucB_1_1	R
1280	iucC_1_1	F
1281	iucC_1_1	R
1282	papG_1_1	F
1283	papG_1_1	R
1284	rfbE_1_1	F
1285	rfbE_1_1	R
1286	shuA_1_1	F
1287	shuA_1_1	R
1288	SLTII_1_1	F
1289	SLTII_1_1	R
1290	toxA-LTPA_1_1	F

SEQ ID NO	Probe name	Direction
1291	toxA-LTPA_1_1	R
1292	VT2vaB_1_1	F
1293	VT2vaB_1_1	R
1294	ardeSE0106_1_1	F
1295	ardeSE0106_1_1	R
1296	ardeSE0107_1_1	F
1297	ardeSE0107_1_1	R
1298	aroiSE0105_1_1	F
1299	aroiSE0105_1_1	R
1300	atlE_1_1	F
1301	atlE_1_1	R
1302	agrB_1_1	F
1303	agrB_1_1	R
1304	agrC_1_1	F
1305	agrC_1_1	R
1306	alphSE1368_1_1	F
1307	alphSE1368_1_1	R
1308	gad_1_1	F
1309	gad_1_1	R
1310	glucSE1191_1_1	F
1311	glucSE1191_1_1	R
1312	hsp10_1_1	F
1313	hsp10_1_1	R
1314	icaA_1_1	F
1315	icaA_1_1	R
1316	icaB_1_1	F
1317	icaB_1_1	R
1318	mvaSSepid_1_1	F
1319	mvaSSepid_1_1	R
1320	nitreSE1972_1_1	F
1321	nitreSE1972_1_1	R
1322	nitreSE1974_1_1	F
1323	nitreSE1974_1_1	R
1324	nitreSE1975_1_1	F
1325	nitreSE1975_1_1	R
1326	oiamtSE1209_1_1	F
1327	oiamtSE1209_1_1	R
1328	ORF1Sepid_1_1	F
1329	ORF1Sepid_1_1	R
1330	ORF3bSepid_1_1	F
1331	ORF3bSepid_1_1	R
1332	qacR_1_1	F
1333	qacR_1_1	R
1334	sin_1_1	F

SEQ ID NO	Probe name	Direction
1335	sin_1_1	R
1336	ureSE1861_1_1	F
1337	ureSE1861_1_1	R
1338	ureSE1863_1_1	F
1339	ureSE1863_1_1	R
1340	ureSE1864_1_1	F
1341	ureSE1864_1_1	R
1342	ureSE1865_1_1	F
1343	ureSE1865_1_1	R
1344	ureSE1867_1_1	F
1345	ureSE1867_1_1	R
1346	gcaD_1_1	F
1347	gcaD_1_1	R
1348	hld_orf5_1_1	F
1349	hld_orf5_1_1	R
1350	icaC_1_1	F
1351	icaC_1_1	R
1352	icaD_1_1	F
1353	icaD_1_1	R
1354	icaR_1_1	F
1355	icaR_1_1	R
1356	psm_beta1and2_1_1	F
1357	psm_beta1and2_1_1	R
1358	purR_1_1	F
1359	purR_1_1	R
1360	spoVG_1_1	F
1361	spoVG_1_1	R
1362	yabJ_1_1	F
1363	yabJ_1_1	R
1364	folQShaemolyt_1_1	F
1365	folQShaemolyt_1_1	R
1366	mvaCShaemolyticus_1_1	F
1367	mvaCShaemolyticus_1_1	R
1368	mvaDShaemolyt_1_1	F
1369	mvaDShaemolyt_1_1	R
1370	mvaK1Shaemolyticus_1_1	F
1371	mvaK1Shaemolyticus_1_1	R
1372	mvaSShaemolyticus_1_1	F
1373	mvaSShaemolyticus_1_1	R
1374	RNApolsigm_1_1	F
1375	RNApolsigm_1_1	R
1376	lipShaemolyt_1_1	F
1377	lipShaemolyt_1_1	R
1378	agrB2Stalugd_1_1	F

SEQ ID NO	Probe name	Direction
1379	agrB2Stalugd_1_1	R
1380	agrC2Stalugd_1_1	F
1381	agrC2Stalugd_1_1	R
1382	agrCStalugd_1_1	F
1383	agrCStalugd_1_1	R
1384	slamStalugd_1_1	F
1385	slamStalugd_1_1	R
1386	fblStalugd_1_1	F
1387	fblStalugd_1_1	R
1388	slushABCStalugd_1_1	F
1389	slushABCStalugd_1_1	R
1390	RNApolsigmSsapro_1_1	F
1391	RNApolsigmSsapro_1_1	R
1392	RNApolsigmSsapro_1_2	F
1393	RNApolsigmSsapro_1_2	R
1394	msrw1Stwar_1_1	F
1395	msrw1Stwar_1_1	R
1396	nukMStwar_1_1	F
1397	nukMStwar_1_1	R
1398	proDStwar_1_1	F
1399	proDStwar_1_1	R
1400	proMStwar_1_1	F
1401	proMStwar_1_1	R
1402	sigrpoStwar_1_1	F
1403	sigrpoStwar_1_1	R
1404	tnpStwar_1_1	F
1405	tnpStwar_1_1	R
1406	gehAStwar_1_1	F
1407	gehAStwar_1_1	R
1408	ARG56_1_1	F
1409	ARG56_1_1	R
1410	ASL43f_1_1	F
1411	ASL43f_1_1	R
1412	BGL2_1_1	F
1413	BGL2_1_1	R
1414	CACHS3_1_1	F
1415	CACHS3_1_1	R
1416	CCT8_1_1	F
1417	CCT8_1_1	R
1418	CDC37_1_1	F
1419	CDC37_1_1	R
1420	CEF3_1_1	F
1421	CEF3_1_1	R
1422	CHS1_1_1	F

SEQ ID NO	Probe name	Direction
1423	CHS1_1_1	R
1424	CHS2_1_1	F
1425	CHS2_1_1	R
1426	CHS4_1_1	F
1427	CHS4_1_1	R
1428	CHS5_1_1	F
1429	CHS5_1_1	R
1430	CHT1_1_1	F
1431	CHT1_1_1	R
1432	CHT2_1_1	F
1433	CHT2_1_1	R
1434	CHT4_1_1	F
1435	CHT4_1_1	R
1436	CSA1_1_1	F
1437	CSA1_1_1	R
1438	5triphosphatase_1_1	F
1439	5triphosphatase_1_1	R
1440	AAF1_1_1	F
1441	AAF1_1_1	R
1442	ADH1_1_1	F
1443	ADH1_1_1	R
1444	ALS1_1_1	F
1445	ALS1_1_1	R
1446	ALS7_1_1	F
1447	ALS7_1_1	R
1448	EDT1_1_1	F
1449	EDT1_1_1	R
1450	ELF_1_1	F
1451	ELF_1_1	R
1452	ESS1_1_1	F
1453	ESS1_1_1	R
1454	FAL1_1_1	F
1455	FAL1_1_1	R
1456	GAP1_1_1	F
1457	GAP1_1_1	R
1458	GNA1_1_1	F
1459	GNA1_1_1	R
1460	GSC1_1_1	F
1461	GSC1_1_1	R
1462	GSL1_1_1	F
1463	GSL1_1_1	R
1464	HIS1_1_1	F
1465	HIS1_1_1	R
1466	HTS1_1_1	F

SEQ ID NO	Probe name	Direction
1467	HTS1_1_1	R
1468	HWP1_2_1	F
1469	HWP1_2_1	R
1470	HYR1_1_1	F
1471	HYR1_1_1	R
1472	INT1a_1_1	F
1473	INT1a_1_1	R
1474	KRE15f_1_1	F
1475	KRE15f_1_1	R
1476	KRE6_1_1	F
1477	KRE6_1_1	R
1478	KRE9_1_1	F
1479	KRE9_1_1	R
1480	MIG1_1_1	F
1481	MIG1_1_1	R
1482	MLS1_1_1	F
1483	MLS1_1_1	R
1484	MP65_1_1	F
1485	MP65_1_1	R
1486	NDE1_1_1	F
1487	NDE1_1_1	R
1488	PFK2_1_1	F
1489	PFK2_1_1	R
1490	PHR1_1_1	F
1491	PHR1_1_1	R
1492	PHR2_1_1	F
1493	PHR2_1_1	R
1494	PHR3_1_1	F
1495	PHR3_1_1	R
1496	PRA1_1_1	F
1497	PRA1_1_1	R
1498	PRS1_1_1	F
1499	PRS1_1_1	R
1500	RBT1_1_1	F
1501	RBT1_1_1	R
1502	RBT4_1_1	F
1503	RBT4_1_1	R
1504	RHO1_1_1	F
1505	RHO1_1_1	R
1506	RNR1_1_1	F
1507	RNR1_1_1	R
1508	RPB7_1_1	F
1509	RPB7_1_1	R
1510	RPL13_1_1	F

SEQ ID NO	Probe name	Direction
1511	RPL13_1_1	R
1512	RVS167_1_1	F
1513	RVS167_1_1	R
1514	SHA3_1_1	F
1515	SHA3_1_1	R
1516	SKN1_1_1	F
1517	SKN1_1_1	R
1518	SRB1_1_1	F
1519	SRB1_1_1	R
1520	TCA1_1_1	F
1521	TCA1_1_1	R
1522	TRP1_1_1	F
1523	TRP1_1_1	R
1524	YAE1_1_1	F
1525	YAE1_1_1	R
1526	YRB1_1_1	F
1527	YRB1_1_1	R
1528	YST1exon2_1_1	F
1529	YST1exon2_1_1	R
1530	CCN1_1_1	F
1531	CCN1_1_1	R
1532	CDC28_1_1	F
1533	CDC28_1_1	R
1534	CLN2_1_1	F
1535	CLN2_1_1	R
1536	CPH1_1_1	F
1537	CPH1_1_1	R
1538	CYB1_1_1	F
1539	CYB1_1_1	R
1540	EFG1_1_1	F
1541	EFG1_1_1	R
1542	MNT1_1_1	F
1543	MNT1_1_1	R
1544	RBF1_1_1	F
1545	RBF1_1_1	R
1546	RBF1_2_1	F
1547	RBF1_2_1	R
1548	RIM101_1_1	F
1549	RIM101_1_1	R
1550	RIM8_1_1	F
1551	RIM8_1_1	R
1552	SEC14_1_1	F
1553	SEC14_1_1	R
1554	SEC4_1_1	F

SEQ ID NO	Probe name	Direction
1555	SEC4_1_1	R
1556	TUP1_1_1	F
1557	TUP1_1_1	R
1558	YPT1_1_1	F
1559	YPT1_1_1	R
1560	ZNF1CZF1_2_1	F
1561	ZNF1CZF1_2_1	R
1562	arcA_1_1	F
1563	arcA_1_1	R
1564	arcC_1_1	F
1565	arcC_1_1	R
1566	bkdA_1_1	F
1567	bkdA_1_1	R
1568	cad_1_1	F
1569	cad_1_1	R
1570	camE1_1_1	F
1571	camE1_1_1	R
1572	csrA_1_1	F
1573	csrA_1_1	R
1574	dacA_1_1	F
1575	dacA_1_1	R
1576	dfr_1_1	F
1577	dfr_1_1	R
1578	dhoD1a_1_1	F
1579	dhoD1a_1_1	R
1580	ABC-eltA_1_1	F
1581	ABC-eltA_1_1	R
1582	agrBfs_1_1	F
1583	agrBfs_1_1	R
1584	agrCfs_1_1	F
1585	agrCfs_1_1	R
1586	dnaE_1_1	F
1587	dnaE_1_1	R
1588	ebsA_1_1	F
1589	ebsA_1_1	R
1590	ebsB_1_1	F
1591	ebsB_1_1	R
1592	eep_1_1	F
1593	eep_1_1	R
1594	efaR_1_1	F
1595	efaR_1_1	R
1596	gls24_glsB_1_1	F
1597	gls24_glsB_1_1	R
1598	gph_1_1	F

SEQ ID NO	Probe name	Direction
1599	gph_1_1	R
1600	gyrAEf_1_1	F
1601	gyrAEf_1_1	R
1602	metEf_1_1	F
1603	metEf_1_1	R
1604	mntHCb2_1_1	F
1605	mntHCb2_1_1	R
1606	mob2_1_1	F
1607	mob2_1_1	R
1608	mvaD_1_1	F
1609	mvaD_1_1	R
1610	mvaE_1_1	F
1611	mvaE_1_1	R
1612	parC_1_1	F
1613	parC_1_1	R
1614	pcfG_1_1	F
1615	pcfG_1_1	R
1616	phoZ_1_1	F
1617	phoZ_1_1	R
1618	polC_1_1	F
1619	polC_1_1	R
1620	ptb_1_1	F
1621	ptb_1_1	R
1622	recS1_1_1	F
1623	recS1_1_1	R
1624	rpoN_1_1	F
1625	rpoN_1_1	R
1626	tms_1_1	F
1627	tms_1_1	R
1628	tyrDC_1_1	F
1629	tyrDC_1_1	R
1630	tyrS_1_1	F
1631	tyrS_1_1	R
1632	asa1_1_1	F
1633	asa1_1_1	R
1634	asp1_1_1	F
1635	asp1_1_1	R
1636	cgh_1_1	F
1637	cgh_1_1	R
1638	cylA_1_1	F
1639	cylA_1_1	R
1640	cylB_1_1	F
1641	cylB_1_1	R
1642	cylI_1_1	F

SEQ ID NO	Probe name	Direction
1643	cylI_1_1	R
1644	cylL_cylS_1_1	F
1645	cylL_cylS_1_1	R
1646	cylM_1_1	F
1647	cylM_1_1	R
1648	ace_1_1	F
1649	ace_1_1	R
1650	ef00108_1_1	F
1651	ef00108_1_1	R
1652	ef00109_1_1	F
1653	ef00109_1_1	R
1654	ef0011_1_1	F
1655	ef0011_1_1	R
1656	ef00113_1_1	F
1657	ef00113_1_1	R
1658	ef0012_1_1	F
1659	ef0012_1_1	R
1660	ef0022_1_1	F
1661	ef0022_1_1	R
1662	ef0031_1_1	F
1663	ef0031_1_1	R
1664	ef0032_1_1	F
1665	ef0032_1_1	R
1666	ef0040_1_1	F
1667	ef0040_1_1	R
1668	ef0058_1_1	F
1669	ef0058_1_1	R
1670	enlA_1_1	F
1671	enlA_1_1	R
1672	esa_1_1	F
1673	esa_1_1	R
1674	esp_1_1	F
1675	esp_1_1	R
1676	gelE_1_1	F
1677	gelE_1_1	R
1678	groEL_1_1	F
1679	groEL_1_1	R
1680	groES_1_1	F
1681	groES_1_1	R
1682	rt1_1_1	F
1683	rt1_1_1	R
1684	sala_1_1	F
1685	sala_1_1	R
1686	salb_1_1	F

SEQ ID NO	Probe name	Direction
1687	salb_1_1	R
1688	sea1_1_1	F
1689	sea1_1_1	R
1690	sep1_1_1	F
1691	sep1_1_1	R
1692	vicK_1_1	F
1693	vicK_1_1	R
1694	yycH_1_1	F
1695	yycH_1_1	R
1696	yycI_1_1	F
1697	yycI_1_1	R
1698	yycJ_1_1	F
1699	yycJ_1_1	R
1700	bglB_1_1	F
1701	bglB_1_1	R
1702	bglR_1_1	F
1703	bglR_1_1	R
1704	bglS_1_1	F
1705	bglS_1_1	R
1706	efmA_1_1	F
1707	efmA_1_1	R
1708	efmB_1_1	F
1709	efmB_1_1	R
1710	efmC_1_1	F
1711	efmC_1_1	R
1712	mreC_1_1	F
1713	mreC_1_1	R
1714	mreD_1_1	F
1715	mreD_1_1	R
1716	mvaDEfaecium_1_1	F
1717	mvaDEfaecium_1_1	R
1718	mvaEEfaecium_1_1	F
1719	mvaEEfaecium_1_1	R
1720	mvaK1Efaecium_1_1	F
1721	mvaK1Efaecium_1_1	R
1722	mvaK2Efaecium_1_1	F
1723	mvaK2Efaecium_1_1	R
1724	mvaSEfaecium_1_1	F
1725	mvaSEfaecium_1_1	R
1726	orf3_4Efaeciumb_1_1	F
1727	orf3_4Efaeciumb_1_1	R
1728	orf6_7Efaecium_1_1	F
1729	orf6_7Efaecium_1_1	R
1730	orf7_8Efaecium_1_1	F

SEQ ID NO	Probe name	Direction
1731	orf7_8Efaecium_1_1	R
1732	orf9_10Efaecium_1_1	F
1733	orf9_10Efaecium_1_1	R
1734	entA_entI_1_1	F
1735	entA_entI_1_1	R
1736	entD_1_1	F
1737	entD_1_1	R
1738	entR_1_1	F
1739	entR_1_1	R
1740	oep_1_1	F
1741	oep_1_1	R
1742	sagA_1_2	F
1743	sagA_1_2	R
1744	atsA_1_1	F
1745	atsA_1_1	R
1746	atsB_1_1	F
1747	atsB_1_1	R
1748	budC_1_1	F
1749	budC_1_1	R
1750	citA_1_1	F
1751	citA_1_1	R
1752	citW_1_1	F
1753	citW_1_1	R
1754	citX_1_1	F
1755	citX_1_1	R
1756	dalD_1_1	F
1757	dalD_1_1	R
1758	dalK_1_1	F
1759	dalK_1_1	R
1760	dalT_1_1	F
1761	dalT_1_1	R
1762	acoA_1_1	F
1763	acoA_1_1	R
1764	acoB_1_1	F
1765	acoB_1_1	R
1766	acoC_1_1	F
1767	acoC_1_1	R
1768	ahlK_1_1	F
1769	ahlK_1_1	R
1770	fimK_1_1	F
1771	fimK_1_1	R
1772	glfKPN2_1_1	F
1773	glfKPN2_1_1	R
1774	ltrA_1_1	F

SEQ ID NO	Probe name	Direction
1775	ltrA_1_1	R
1776	mdcC_1_1	F
1777	mdcC_1_1	R
1778	mdcF_1_1	F
1779	mdcF_1_1	R
1780	mdcH_1_1	F
1781	mdcH_1_1	R
1782	mrkA_1_1	F
1783	mrkA_1_1	R
1784	mtrK_1_1	F
1785	mtrK_1_1	R
1786	nifF_1_1	F
1787	nifF_1_1	R
1788	nifK_1_1	F
1789	nifK_1_1	R
1790	nifN_1_1	F
1791	nifN_1_1	R
1792	tyrP_1_1	F
1793	tyrP_1_1	R
1794	ureA_1_1	F
1795	ureA_1_1	R
1796	wbbO_1_1	F
1797	wbbO_1_1	R
1798	wza_1_1	F
1799	wza_1_1	R
1800	wzb_1_1	F
1801	wzb_1_1	R
1802	wzmKPN2_1_1	F
1803	wzmKPN2_1_1	R
1804	wztKPN2_1_1	F
1805	wztKPN2_1_1	R
1806	yojH_1_1	F
1807	yojH_1_1	R
1808	liac_1_1	F
1809	liac_1_1	R
1810	cim_1_1	F
1811	cim_1_1	R
1812	aldA_1_1	F
1813	aldA_1_1	R
1814	aldA_2_1	F
1815	aldA_2_1	R
1816	hemly_1_1	F
1817	hemly_1_1	R
1818	pSL017_1_1	F

SEQ ID NO	Probe name	Direction
1819	pSL017_1_1	R
1820	pSL020_1_1	F
1821	pSL020_1_1	R
1822	rcsA_1_1	F
1823	rcsA_1_1	R
1824	rmlC_1_1	F
1825	rmlC_1_1	R
1826	rmlD_1_1	F
1827	rmlD_1_1	R
1828	waaG_1_1	F
1829	waaG_1_1	R
1830	wbbD_1_1	F
1831	wbbD_1_1	R
1832	wbbM_1_1	F
1833	wbbM_1_1	R
1834	wbbN_1_1	F
1835	wbbN_1_1	R
1836	wbdA_1_1	F
1837	wbdA_1_1	R
1838	wbdC_1_1	F
1839	wbdC_1_1	R
1840	wztKpn_1_1	F
1841	wztKpn_1_1	R
1842	yibD_1_1	F
1843	yibD_1_1	R
1844	cymA_1_1	F
1845	cymA_1_1	R
1846	cymD_1_1	F
1847	cymD_1_1	R
1848	cymE_1_1	F
1849	cymE_1_1	R
1850	cymH_1_1	F
1851	cymH_1_1	R
1852	cymI_1_1	F
1853	cymI_1_1	R
1854	cymJ_1_1	F
1855	cymJ_1_1	R
1856	ddrA_1_1	F
1857	ddrA_1_1	R
1858	fdt-1_1_1	F
1859	fdt-1_1_1	R
1860	fdt-2_1_1	F
1861	fdt-2_1_1	R
1862	fdt-3_1_1	F

SEQ ID NO	Probe name	Direction
1863	fdt-3_1_1	R
1864	gatY_1_1	F
1865	gatY_1_1	R
1866	hydH_1_1	F
1867	hydH_1_1	R
1868	masA_1_1	F
1869	masA_1_1	R
1870	nasA_1_1	F
1871	nasA_1_1	R
1872	nasE_1_1	F
1873	nasE_1_1	R
1874	nasF_1_1	F
1875	nasF_1_1	R
1876	pehX_1_1	F
1877	pehX_1_1	R
1878	pelX_1_1	F
1879	pelX_1_1	R
1880	tagH_1_1	F
1881	tagH_1_1	R
1882	tagK_1_1	F
1883	tagK_1_1	R
1884	tagT_1_1	F
1885	tagT_1_1	R
1886	glpR_1_1	F
1887	glpR_1_1	R
1888	lasRb_1_1	F
1889	lasRb_1_1	R
1890	OrfX_1_1	F
1891	OrfX_1_1	R
1892	pa0260_1_1	F
1893	pa0260_1_1	R
1894	pa0572_1_1	F
1895	pa0572_1_1	R
1896	pa0625_1_1	F
1897	pa0625_1_1	R
1898	pa0636_1_1	F
1899	pa0636_1_1	R
1900	pa1046_1_1	F
1901	pa1046_1_1	R
1902	pa1069_1_1	F
1903	pa1069_1_1	R
1904	pa1846_1_1	F
1905	pa1846_1_1	R
1906	pa3866_1_1	F

SEQ ID NO	Probe name	Direction
1907	pa3866_1_1	R
1908	pa4082_1_1	F
1909	pa4082_1_1	R
1910	pilAp_1_1	F
1911	pilAp_1_1	R
1912	PilAp2_1_1	F
1913	PilAp2_1_1	R
1914	pilC_1_1	F
1915	pilC_1_1	R
1916	PstP_1_1	F
1917	PstP_1_1	R
1918	purK_1_1	F
1919	purK_1_1	R
1920	uvrDII_1_1	F
1921	uvrDII_1_1	R
1922	vsmI_1_1	F
1923	vsmI_1_1	R
1924	vsmR_1_2	F
1925	vsmR_1_2	R
1926	xcpX_1_1	F
1927	xcpX_1_1	R
1928	aprA_1_1	F
1929	aprA_1_1	R
1930	aprE_1_1	F
1931	aprE_1_1	R
1932	ctx_1_2	F
1933	ctx_1_2	R
1934	algB_1_1	F
1935	algB_1_1	R
1936	algN_1_1	F
1937	algN_1_1	R
1938	algR_1_1	F
1939	algR_1_1	R
1940	ExoS_1_1	F
1941	ExoS_1_1	R
1942	fpvA_1_1	F
1943	fpvA_1_1	R
1944	lasRa_1_1	F
1945	lasRa_1_1	R
1946	lipA_1_1	F
1947	lipA_1_1	R
1948	lipH_1_1	F
1949	lipH_1_1	R
1950	Orf159_1_2	F

SEQ ID NO	Probe name	Direction
1951	Orf159_1_2	R
1952	Orf252_1_1	F
1953	Orf252_1_1	R
1954	pchG_1_1	F
1955	pchG_1_1	R
1956	PhzA_1_1	F
1957	PhzA_1_1	R
1958	PhzB_1_1	F
1959	PhzB_1_1	R
1960	PLC_1_1	F
1961	PLC_1_1	R
1962	plcN_1_1	F
1963	plcN_1_1	R
1964	plcR_1_1	F
1965	plcR_1_1	R
1966	pvdD_1_1	F
1967	pvdD_1_1	R
1968	pvdF_1_2	F
1969	pvdF_1_2	R
1970	pyocinS1_1_1	F
1971	pyocinS1_1_1	R
1972	pyocinS1im_1_1	F
1973	pyocinS1im_1_1	R
1974	pyocinS2_1_1	F
1975	pyocinS2_1_1	R
1976	pys2_1_1	F
1977	pys2_1_1	R
1978	pys2_2_1	F
1979	pys2_2_1	R
1980	rbf303_1_1	F
1981	rbf303_1_1	R
1982	rhlA_1_1	F
1983	rhlA_1_1	R
1984	rhlB_1_1	F
1985	rhlB_1_1	R
1986	rhlR_1_1	F
1987	rhlR_1_1	R
1988	TnAP41_1_2	F
1989	TnAP41_1_2	R
1990	toxA_1_1	F
1991	toxA_1_1	R
1992	cap1EStrpneu_1_1	F
1993	cap1EStrpneu_1_1	R
1994	cap1FStrpneu_1_1	F

SEQ ID NO	Probe name	Direction
1995	cap1FStrpneu_1_1	R
1996	cap1GStrpneu_1_1	F
1997	cap1GStrpneu_1_1	R
1998	cap3AStrpneu_1_1	F
1999	cap3AStrpneu_1_1	R
2000	cap3BStrpneu_1_1	F
2001	cap3BStrpneu_1_1	R
2002	celAStrpneu_1_1	F
2003	celAStrpneu_1_1	R
2004	celBStrpneu_1_1	F
2005	celBStrpneu_1_1	R
2006	cglAStrpneu_1_1	F
2007	cglAStrpneu_1_1	R
2008	cglBStrpneu_1_1	F
2009	cglBStrpneu_1_1	R
2010	cglCStrpneu_1_1	F
2011	cglCStrpneu_1_1	R
2012	cglDStrpneu_1_1	F
2013	cglDStrpneu_1_1	R
2014	cinA_1_1	F
2015	cinA_1_1	R
2016	cps14EStrpneum_1_1	F
2017	cps14EStrpneum_1_1	R
2018	cps14FStrpneum_1_1	F
2019	cps14FStrpneum_1_1	R
2020	cps14GStrpneum_1_1	F
2021	cps14GStrpneum_1_1	R
2022	cps14HStrpneum_1_1	F
2023	cps14HStrpneum_1_1	R
2024	cps19aHStrpneum_1_1	F
2025	cps19aHStrpneum_1_1	R
2026	cps19aIStrpneum_1_1	F
2027	cps19aIStrpneum_1_1	R
2028	cps19aKStrpneum_1_1	F
2029	cps19aKStrpneum_1_1	R
2030	cps19fGStrpneum_1_1	F
2031	cps19fGStrpneum_1_1	R
2032	cps23fGStrpneum_1_1	F
2033	cps23fGStrpneum_1_1	R
2034	dexB_1_1	F
2035	dexB_1_1	R
2036	dinF_1_1	F
2037	dinF_1_1	R
2038	1760Strpneu_1_1	F

SEQ ID NO	Probe name	Direction
2039	1760Strpneu_1_1	R
2040	acyPStrpneu_1_1	F
2041	acyPStrpneu_1_1	R
2042	endAStrpneu_1_1	F
2043	endAStrpneu_1_1	R
2044	exoAStrpneu_1_1	F
2045	exoAStrpneu_1_1	R
2046	exp72_1_1	F
2047	exp72_1_1	R
2048	fnlAStrpneu_1_1	F
2049	fnlAStrpneu_1_1	R
2050	fnlBStrpneu_1_1	F
2051	fnlBStrpneu_1_1	R
2052	fnlCStrpneu_1_1	F
2053	fnlCStrpneu_1_1	R
2054	gct18Strpneum_1_1	F
2055	gct18Strpneum_1_1	R
2056	hexB1_1_1	F
2057	hexB1_1_1	R
2058	hftsHstrpneu_1_1	F
2059	hftsHstrpneu_1_1	R
2060	immunofrag1Strpneu_1_1	F
2061	immunofrag1Strpneu_1_1	R
2062	immunofrag2Strpneu_2_1	F
2063	immunofrag2Strpneu_2_1	R
2064	immunofrag3Strpneu_2_1	F
2065	immunofrag3Strpneu_2_1	R
2066	kdtBStrpneu_1_1	F
2067	kdtBStrpneu_1_1	R
2068	lysAStrpneu_1_1	F
2069	lysAStrpneu_1_1	R
2070	pcpBStrpneu_1_1	F
2071	pcpBStrpneu_1_1	R
2072	pflCStrpneu_1_1	F
2073	pflCStrpneu_1_1	R
2074	plpA_1_1	F
2075	plpA_1_1	R
2076	prtA1Strpneu_1_1	F
2077	prtA1Strpneu_1_1	R
2078	pspC1Strpneu_1_1	F
2079	pspC1Strpneu_1_1	R
2080	pspC2_1_1	F
2081	pspC2_1_1	R
2082	purRStrpneu_1_1	F

SEQ ID NO	Probe name	Direction
2083	purRStrpneu_1_1	R
2084	pyrDAStrpneum_1_1	F
2085	pyrDAStrpneum_1_1	R
2086	SP0828Strpneu_1_1	F
2087	SP0828Strpneu_1_1	R
2088	SP0830Strpneu_1_1	F
2089	SP0830Strpneu_1_1	R
2090	SP0833Strpneu_1_1	F
2091	SP0833Strpneu_1_1	R
2092	SP0837_38Strpneu_1_1	F
2093	SP0837_38Strpneu_1_1	R
2094	SP0839Strpneu_1_1	F
2095	SP0839Strpneu_1_1	R
2096	ugdStrpneu_1_1	F
2097	ugdStrpneu_1_1	R
2098	uncC_1_1	F
2099	uncC_1_1	R
2100	vicXStrepneu_1_1	F
2101	vicXStrepneu_1_1	R
2102	wchA6bStrpneum_1_1	F
2103	wchA6bStrpneum_1_1	R
2104	wci4Strpneum_1_1	F
2105	wci4Strpneum_1_1	R
2106	wciK4Strpneum_1_1	F
2107	wciK4Strpneum_1_1	R
2108	wciL4Strpneum_1_1	F
2109	wciL4Strpneum_1_1	R
2110	wciN6bStrpneum_1_1	F
2111	wciN6bStrpneum_1_1	R
2112	wciO6bStrpneum_1_1	F
2113	wciO6bStrpneum_1_1	R
2114	wciP6bStrpneum_1_1	F
2115	wciP6bStrpneum_1_1	R
2116	wciY18Strpneum_1_1	F
2117	wciY18Strpneum_1_1	R
2118	wzdbStrpneum_1_1	F
2119	wzdbStrpneum_1_1	R
2120	wze6bStrpneum_1_1	F
2121	wze6bStrpneum_1_1	R
2122	wzy18Strpneum_1_1	F
2123	wzy18Strpneum_1_1	R
2124	wzy4Strpneum_1_1	F
2125	wzy4Strpneum_1_1	R
2126	wzy6bStrpneum_1_1	F

SEQ ID NO	Probe name	Direction
2127	wzy6bStrpneum_1_1	R
2128	xpt_1_1	F
2129	xpt_1_1	R
2130	igaStrpneu_1_1	F
2131	igaStrpneu_1_1	R
2132	lytA_1_1	F
2133	lytA_1_1	R
2134	nanA_1_1	F
2135	nanA_1_1	R
2136	nanBStrpneu_1_1	F
2137	nanBStrpneu_1_1	R
2138	pcpCStrpneu_1_1	F
2139	pcpCStrpneu_1_1	R
2140	ply_1_1	F
2141	ply_1_1	R
2142	prtAStrpneu_1_1	F
2143	prtAStrpneu_1_1	R
2144	pspA_1_2	F
2145	pspA_1_2	R
2146	SP0834Strpneu_1_1	F
2147	SP0834Strpneu_1_1	R
2148	SP0834Strpneu_1_2	F
2149	SP0834Strpneu_1_2	R
2150	sphtraStrpneu_1_1	F
2151	sphtraStrpneu_1_1	R
2152	wciJStrpneu_1_1	F
2153	wciJStrpneu_1_1	R
2154	wziyStrpneu_1_1	F
2155	wziyStrpneu_1_1	R
2156	wzxStrpneu_1_1	F
2157	wzxStrpneu_1_1	R
2158	cpsA1Strgal_1_1	F
2159	cpsA1Strgal_1_1	R
2160	cpsB1Strgal_1_1	F
2161	cpsB1Strgal_1_1	R
2162	cpsC1Strgal_1_1	F
2163	cpsC1Strgal_1_1	R
2164	cpsD1Strgal_1_1	F
2165	cpsD1Strgal_1_1	R
2166	cpsE1Strgal_1_1	F
2167	cpsE1Strgal_1_1	R
2168	cpsG1Strgal_1_1	F
2169	cpsG1Strgal_1_1	R
2170	cpsIStragal_1_1	F

SEQ ID NO	Probe name	Direction
2171	cpsIStragal_1_1	R
2172	cpsJStragal_1_1	F
2173	cpsJStragal_1_1	R
2174	cpsKStragal_1_1	F
2175	cpsKStragal_1_1	R
2176	cpsMStragal_1_1	F
2177	cpsMStragal_1_1	R
2178	cpsYStragal_1_1	F
2179	cpsYStragal_1_1	R
2180	cpsYStragal_2_1	F
2181	cpsYStragal_2_1	R
2182	cylBStraga_1_1	F
2183	cylBStraga_1_1	R
2184	cylEStraga_1_1	F
2185	cylEStraga_1_1	R
2186	cylFStraga_1_1	F
2187	cylFStraga_1_1	R
2188	cylHStraga_1_1	F
2189	cylHStraga_1_1	R
2190	cylIStraga_1_1	F
2191	cylIStraga_1_1	R
2192	cylJStraga_1_1	F
2193	cylJStraga_1_1	R
2194	cylKStraga_1_1	F
2195	cylKStraga_1_1	R
2196	0487Straga_1_1	F
2197	0487Straga_1_1	R
2198	0488Straga_1_1	F
2199	0488Straga_1_1	R
2200	0493Straga_1_1	F
2201	0493Straga_1_1	R
2202	0495Straga_1_1	F
2203	0495Straga_1_1	R
2204	0498Straga_1_1	F
2205	0498Straga_1_1	R
2206	0500Straga_1_1	F
2207	0500Straga_1_1	R
2208	0502Straga_1_1	F
2209	0502Straga_1_1	R
2210	0504Straga_1_1	F
2211	0504Straga_1_1	R
2212	folDStraga_1_1	F
2213	folDStraga_1_1	R
2214	neuA1Strgal_1_1	F

SEQ ID NO	Probe name	Direction
2215	neuA1Strgal_1_1	R
2216	neuB1Strgal_1_1	F
2217	neuB1Strgal_1_1	R
2218	neuC1Strgal_1_1	F
2219	neuC1Strgal_1_1	R
2220	neuD1Strgal_1_1	F
2221	neuD1Strgal_1_1	R
2222	recNStraga_1_1	F
2223	recNStraga_1_1	R
2224	ileSStraga_1_1	F
2225	ileSStraga_1_1	R
2226	CAMPfactor_1_1	F
2227	CAMPfactor_1_1	R
2228	CAMPfactor_2_1	F
2229	CAMPfactor_2_1	R
2230	0499Straga_1_1	F
2231	0499Straga_1_1	R
2232	hylStragal_1_1	F
2233	hylStragal_1_1	R
2234	lipStragal_1_1	F
2235	lipStragal_1_1	R
2236	cyclStrpyog_1_1	F
2237	cyclStrpyog_1_1	R
2238	fah_rph_hlo_Strpyog_1_1	F
2239	fah_rph_hlo_Strpyog_1_1	R
2240	int_1_1	F
2241	int_1_1	R
2242	int315.5_1_1	F
2243	int315.5_1_1	R
2244	murEStrpyog_1_1	F
2245	murEStrpyog_1_1	R
2246	oppA_1_1	F
2247	oppA_1_1	R
2248	oppCStrpyog_1_1	F
2249	oppCStrpyog_1_1	R
2250	oppD_1_1	F
2251	oppD_1_1	R
2252	SPy0382Strpyog_1_1	F
2253	SPy0382Strpyog_1_1	R
2254	SPy0390Strpyog_1_1	F
2255	SPy0390Strpyog_1_1	R
2256	SpyM3_1351_1_1	F
2257	SpyM3_1351_1_1	R
2258	vicXStrpyog_1_1	F

SEQ ID NO	Probe name	Direction
2259	vicXStrpyog_1_1	R
2260	DNaseIStrpyog_1_1	F
2261	DNaseIStrpyog_1_1	R
2262	fba2Strpyog_1_1	F
2263	fba2Strpyog_1_1	R
2264	fhuAStrpyog_1_1	F
2265	fhuAStrpyog_1_1	R
2266	fhuB1Strpyog_1_1	F
2267	fhuB1Strpyog_1_1	R
2268	fhuDStrpyog_1_1	F
2269	fhuDStrpyog_1_1	R
2270	fhuGStrpyog_1_1	F
2271	fhuGStrpyog_1_1	R
2272	hylA_1_1	F
2273	hylA_1_1	R
2274	hylP_1_1	F
2275	hylP_1_1	R
2276	hylp2_1_1	F
2277	hylp2_1_1	R
2278	oppB_1_1	F
2279	oppB_1_1	R
2280	ropB_1_1	F
2281	ropB_1_1	R
2282	scpAStrpyog_1_1	F
2283	scpAStrpyog_1_1	R
2284	sloStrpyog_1_1	F
2285	sloStrpyog_1_1	R
2286	smez-4Strpyog_1_1	F
2287	smez-4Strpyog_1_1	R
2288	sof_1_1	F
2289	sof_1_1	R
2290	sof_2_1	F
2291	sof_2_1	R
2292	speA_1_1	F
2293	speA_1_1	R
2294	speB2Strpyog_1_1	F
2295	speB2Strpyog_1_1	R
2296	speCStrpyog_1_1	F
2297	speCStrpyog_1_1	R
2298	speJStrpyog_1_1	F
2299	speJStrpyog_1_1	R
2300	srtBStrpyog_1_1	F
2301	srtBStrpyog_1_1	R
2302	srtCStrpyog_1_1	F

SEQ ID NO	Probe name	Direction
2303	srtCStrpyog_1_1	R
2304	srtEStrpyog_1_1	F
2305	srtEStrpyog_1_1	R
2306	srtFStrpyog_1_1	F
2307	srtFStrpyog_1_1	R
2308	srtGStrpyog_1_1	F
2309	srtGStrpyog_1_1	R
2310	srtIStrpyog_1_1	F
2311	srtIStrpyog_1_1	R
2312	srtKStrpyog_1_1	F
2313	srtKStrpyog_1_1	R
2314	srtRStrpyog_1_1	F
2315	srtRStrpyog_1_1	R
2316	srtTStrpyog_1_1	F
2317	srtTStrpyog_1_1	R
2318	vicKStrpyog_1_1	F
2319	vicKStrpyog_1_1	R
2320	573Stprmut_1_1	F
2321	573Stprmut_1_1	R
2322	580SStprmut_1_1	F
2323	580SStprmut_1_1	R
2324	581_582SStprmut_1_1	F
2325	581_582SStprmut_1_1	R
2326	584SStprmut_1_1	F
2327	584SStprmut_1_1	R
2328	dltAStrmut_1_1	F
2329	dltAStrmut_1_1	R
2330	dltBStrmut_1_1	F
2331	dltBStrmut_1_1	R
2332	dltCppx1Strmut_1_1	F
2333	dltCppx1Strmut_1_1	R
2334	dltDStrmut_1_1	F
2335	dltDStrmut_1_1	R
2336	lichStrbov_1_1	F
2337	lichStrbov_1_1	R
2338	lytRStprmut_1_1	F
2339	lytRStprmut_1_1	R
2340	lytSStprmut_1_1	F
2341	lytSStprmut_1_1	R
2342	pepQStrrmut_1_1	F
2343	pepQStrrmut_1_1	R
2344	pflCStrmut_1_1	F
2345	pflCStrmut_1_1	R
2346	recNStprmut_1_1	F

SEQ ID NO	Probe name	Direction
2347	recNStprmut_1_1	R
2348	ytqBStrmut_1_1	F
2349	ytqBStrmut_1_1	R
2350	hlyXStrmut_1_1	F
2351	hlyXStrmut_1_1	R
2352	igaStrmitis_1_1	F
2353	igaStrmitis_1_1	R
2354	igaStrsanguis_1_1	F
2355	igaStrsanguis_1_1	R
2356	perMStrmut_1_1	F
2357	perMStrmut_1_1	R
2358	atfA_1_1	F
2359	atfA_1_1	R
2360	atfB_1_1	F
2361	atfB_1_1	R
2362	atfC_1_1	F
2363	atfC_1_1	R
2364	ccmPrmi1_1_1	F
2365	ccmPrmi1_1_1	R
2366	cyaPrmi_1_1	F
2367	cyaPrmi_1_1	R
2368	aad_1_1	F
2369	aad_1_1	R
2370	flfB_1_1	F
2371	flfB_1_1	R
2372	flfD_1_1	F
2373	flfD_1_1	R
2374	flfN_1_1	F
2375	flfN_1_1	R
2376	flhD_1_1	F
2377	flhD_1_1	R
2378	floA_1_1	F
2379	floA_1_1	R
2380	ftsK_1_1	F
2381	ftsK_1_1	R
2382	gstB_1_1	F
2383	gstB_1_1	R
2384	hemCPrmi_1_1	F
2385	hemCPrmi_1_1	R
2386	hemDPrmi_1_1	F
2387	hemDPrmi_1_1	R
2388	hev_1_1	F
2389	hev_1_1	R
2390	katA_1_1	F

SEQ ID NO	Probe name	Direction
2391	katA_1_1	R
2392	lpp1_1_1	F
2393	lpp1_1_1	R
2394	menE_1_1	F
2395	menE_1_1	R
2396	mfd_1_1	F
2397	mfd_1_1	R
2398	nrpA_1_1	F
2399	nrpA_1_1	R
2400	nrpB_1_1	F
2401	nrpB_1_1	R
2402	nrpG_1_1	F
2403	nrpG_1_1	R
2404	nrpS_1_1	F
2405	nrpS_1_1	R
2406	nrpT_1_1	F
2407	nrpT_1_1	R
2408	nrpU_1_1	F
2409	nrpU_1_1	R
2410	pat_1_1	F
2411	pat_1_1	R
2412	pmfA_1_1	F
2413	pmfA_1_1	R
2414	pmfC_1_1	F
2415	pmfC_1_1	R
2416	pmfE_1_1	F
2417	pmfE_1_1	R
2418	ppaA_1_1	F
2419	ppaA_1_1	R
2420	rsbA_1_1	F
2421	rsbA_1_1	R
2422	rsbC_1_1	F
2423	rsbC_1_1	R
2424	speB_1_1	F
2425	speB_1_1	R
2426	stmA_1_1	F
2427	stmA_1_1	R
2428	stmB_1_1	F
2429	stmB_1_1	R
2430	terA_1_1	F
2431	terA_1_1	R
2432	terD_1_1	F
2433	terD_1_1	R
2434	umoA_1_1	F

SEQ ID NO	Probe name	Direction
2435	umoA_1_1	R
2436	umoB_1_1	F
2437	umoB_1_1	R
2438	umoC_1_1	F
2439	umoC_1_1	R
2440	ureR_1_1	F
2441	ureR_1_1	R
2442	xerC_1_1	F
2443	xerC_1_1	R
2444	ygbA_1_1	F
2445	ygbA_1_1	R
2446	flaA_1_1	F
2447	flaA_1_1	R
2448	flaD_1_1	F
2449	flaD_1_1	R
2450	fliA_1_1	F
2451	fliA_1_1	R
2452	hpmA_1_1	F
2453	hpmA_1_1	R
2454	hpmB_1_1	F
2455	hpmB_1_1	R
2456	lpsPrmi_1_1	F
2457	lpsPrmi_1_1	R
2458	mrpA_1_1	F
2459	mrpA_1_1	R
2460	mrpB_1_1	F
2461	mrpB_1_1	R
2462	mrpC_1_1	F
2463	mrpC_1_1	R
2464	mrpD_1_1	F
2465	mrpD_1_1	R
2466	mrpE_1_1	F
2467	mrpE_1_1	R
2468	mrpF_1_1	F
2469	mrpF_1_1	R
2470	mrpG_1_1	F
2471	mrpG_1_1	R
2472	mrpH_1_1	F
2473	mrpH_1_1	R
2474	mrpI_1_1	F
2475	mrpI_1_1	R
2476	mrpJ_1_1	F
2477	mrpJ_1_1	R
2478	patA_1_1	F

SEQ ID NO	Probe name	Direction
2479	patA_1_1	R
2480	putA_1_1	F
2481	putA_1_1	R
2482	uca_1_1	F
2483	uca_1_1	R
2484	ureDPrmi_1_1	F
2485	ureDPrmi_1_1	R
2486	ureEPrmi_1_1	F
2487	ureEPrmi_1_1	R
2488	ureFPrmi_1_1	F
2489	ureFPrmi_1_1	R
2490	zapA_1_1	F
2491	zapA_1_1	R
2492	zapB_1_1	F
2493	zapB_1_1	R
2494	zapD_1_1	F
2495	zapD_1_1	R
2496	zapE_1_1	F
2497	zapE_1_1	R
2498	envZPrvu_1_1	F
2499	envZPrvu_1_1	R
2500	frdC_1_1	F
2501	frdC_1_1	R
2502	frdD_1_1	F
2503	frdD_1_1	R
2504	infBPrvu_1_1	F
2505	infBPrvu_1_1	R
2506	lad_1_1	F
2507	lad_1_1	R
2508	tna2_1_1	F
2509	tna2_1_1	R
2510	end_1_1	F
2511	end_1_1	R
2512	pqrA_1_1	F
2513	pqrA_1_1	R
2514	urg_1_1	F
2515	urg_1_1	R
2516	blaIMP-7_1_1	F
2517	blaIMP-7_1_1	R
2518	mecISepid_1_1	F
2519	mecISepid_1_1	R
2520	blaOXA-10_1_2	F
2521	blaOXA-10_1_2	R
2522	blaB_1_1	F

SEQ ID NO	Probe name	Direction
2523	blaB_1_1	R
2524	ampC_1_1	F
2525	ampC_1_1	R
2526	I-blaR_1_1	F
2527	I-blaR_1_1	R
2528	blaOXA-32_1_1	F
2529	blaOXA-32_1_1	R
2530	bla-CTX-M-22_1_1	F
2531	bla-CTX-M-22_1_1	R
2532	pbp2aStrpneu_1_1	F
2533	pbp2aStrpneu_1_1	R
2534	blaSHV-1_1_1	F
2535	blaSHV-1_1_1	R
2536	blaOXA-2_1_1	F
2537	blaOXA-2_1_1	R
2538	blaRShaemolyt_1_1	F
2539	blaRShaemolyt_1_1	R
2540	blaIMP-7_1_2	F
2541	blaIMP-7_1_2	R
2542	I-mecR_1_1	F
2543	I-mecR_1_1	R
2544	blaOXY_1_1	F
2545	blaOXY_1_1	R
2546	dacCStrpyog_1_1	F
2547	dacCStrpyog_1_1	R
2548	femA_1_1	F
2549	femA_1_1	R
2550	mecA_1_1	F
2551	mecA_1_1	R
2552	blaIShaemolyt_1_1	F
2553	blaIShaemolyt_1_1	R
2554	blavim_1_1	F
2555	blavim_1_1	R
2556	pbp2b_1_1	F
2557	pbp2b_1_1	R
2558	pbp2primeSepid_1_1	F
2559	pbp2primeSepid_1_1	R
2560	pbp2x_1_1	F
2561	pbp2x_1_1	R
2562	pbp3Saureuc_1_1	F
2563	pbp3Saureuc_1_1	R
2564	pbp4_1_1	F
2565	pbp4_1_1	R
2566	pbp5Efaecium_1_1	F

SEQ ID NO	Probe name	Direction
2567	pbp5Efaecium_1_1	R
2568	pbpC_1_1	F
2569	pbpC_1_1	R
2570	I-mecI_1_1	F
2571	I-mecI_1_1	R
2572	pbp1a_1_1	F
2573	pbp1a_1_1	R
2574	I-blaI_1_1	F
2575	I-blaI_1_1	R
2576	blaTEM-106_1_1	F
2577	blaTEM-106_1_1	R
2578	blaOXY-KLOX_1_1	F
2579	blaOXY-KLOX_1_1	R
2580	ftsWEF_1_1	F
2581	ftsWEF_1_1	R
2582	fmhB_1_1	F
2583	fmhB_1_1	R
2584	cumA_1_1	F
2585	cumA_1_1	R
2586	femBShaemolyt_1_1	F
2587	femBShaemolyt_1_1	R
2588	blaPER-1_1_1	F
2589	blaPER-1_1_1	R
2590	bla_FOX-3_1_1	F
2591	bla_FOX-3_1_1	R
2592	blaA_1_1	F
2593	blaA_1_1	R
2594	psrb_1_1	F
2595	psrb_1_1	R
2596	fmhA_1_1	F
2597	fmhA_1_1	R
2598	mecR1Sepid_1_1	F
2599	mecR1Sepid_1_1	R
2600	blaZ_1_1	F
2601	blaZ_1_1	R
2602	blaOXA-1_1_1	F
2603	blaOXA-1_1_1	R
2604	fox-6_1_1	F
2605	fox-6_1_1	R
2606	blaPrmi_1_1	F
2607	blaPrmi_1_1	R
2608	aacA_aphDStwar_1_1	F
2609	aacA_aphDStwar_1_1	R
2610	aacC1_1_2	F

SEQ ID NO	Probe name	Direction
2611	aacC1_1_2	R
2612	aacC2_1_1	F
2613	aacC2_1_1	R
2614	strB_1_1	F
2615	strB_1_1	R
2616	aadA_1_1	F
2617	aadA_1_1	R
2618	aadB_1_2	F
2619	aadB_1_2	R
2620	aadD_1_1	F
2621	aadD_1_1	R
2622	aacA4_1_2	F
2623	aacA4_1_2	R
2624	strA_1_1	F
2625	strA_1_1	R
2626	aph-A3_1_1	F
2627	aph-A3_1_1	R
2628	aacC1_1_1	F
2629	aacC1_1_1	R
2630	aacA4_1_1	F
2631	aacA4_1_1	R
2632	aacA-aphD_1_1	F
2633	aacA-aphD_1_1	R
2634	I-spc_1_1	F
2635	I-spc_1_1	R
2636	aphA3_1_1	F
2637	aphA3_1_1	R
2638	ermC_1_1	F
2639	ermC_1_1	R
2640	linB_1_1	F
2641	linB_1_1	R
2642	satSA_1_1	F
2643	satSA_1_1	R
2644	mdrSA_1_1	F
2645	mdrSA_1_1	R
2646	I-linA_1_1	F
2647	I-linA_1_1	R
2648	ermB_1_2	F
2649	ermB_1_2	R
2650	ermA_1_1	F
2651	ermA_1_1	R
2652	satA_1_1	F
2653	satA_1_1	R
2654	msrA_1_1	F

SEQ ID NO	Probe name	Direction
2655	msrA_1_1	R
2656	mphBM_1_1	F
2657	mphBM_1_1	R
2658	mefA_1_1	F
2659	mefA_1_1	R
2660	mrx_1_1	F
2661	mrx_1_1	R
2662	dfrStrpneu_1_1	F
2663	dfrStrpneu_1_1	R
2664	dfrA_1_1	F
2665	dfrA_1_1	R
2666	cmlA5_1_1	F
2667	cmlA5_1_1	R
2668	catEfaecium_1_1	F
2669	catEfaecium_1_1	R
2670	cat_1_1	F
2671	cat_1_1	R
2672	tetAJ_1_1	F
2673	tetAJ_1_1	R
2674	tetL_1_1	F
2675	tetL_1_1	R
2676	tetM_1_1	F
2677	tetM_1_1	R
2678	vanH(tn)_1_1	F
2679	vanH(tn)_1_1	R
2680	vanA_1_1	F
2681	vanA_1_1	R
2682	vanHB2_1_1	F
2683	vanHB2_1_1	R
2684	vanR_1_1	F
2685	vanR_1_1	R
2686	vanRB2_1_1	F
2687	vanRB2_1_1	R
2688	vanS(tn)_1_1	F
2689	vanS(tn)_1_1	R
2690	vanSB2_1_1	F
2691	vanSB2_1_1	R
2692	vanWB2_1_1	F
2693	vanWB2_1_1	R
2694	ddl_1_1	F
2695	ddl_1_1	R
2696	ble_1_1	F
2697	ble_1_1	R
2698	vanXB2_1_1	F

SEQ ID NO	Probe name	Direction
2699	vanXB2_1_1	R
2700	vanY(tn)_1_1	F
2701	vanY(tn)_1_1	R
2702	vanYB2_1_1	F
2703	vanYB2_1_1	R
2704	vanB_1_1	F
2705	vanB_1_1	R
2706	vanZ(tn)_1_1	F
2707	vanZ(tn)_1_1	R
2708	vanC-2_1_1	F
2709	vanC-2_1_1	R
2710	vanX(tn)_1_1	F
2711	vanX(tn)_1_1	R
2712	acrB_1_1	F
2713	acrB_1_1	R
2714	mexB_1_2	F
2715	mexB_1_2	R
2716	I-qacA_1_1	F
2717	I-qacA_1_1	R
2718	sulI_1_1	F
2719	sulI_1_1	R
2720	sul_1_1	F
2721	sul_1_1	R
2722	cadBStalugd_1_1	F
2723	cadBStalugd_1_1	R
2724	mexA_1_1	F
2725	mexA_1_1	R
2726	acrR_1_1	F
2727	acrR_1_1	R
2728	emeA_1_1	F
2729	emeA_1_1	R
2730	acrA_1_1	F
2731	acrA_1_1	R
2732	rtn_1_1	F
2733	rtn_1_1	R
2734	abcXStrpmut_1_1	F
2735	abcXStrpmut_1_1	R
2736	qacEdelta1_1_1	F
2737	qacEdelta1_1_1	R
2738	elkT-abcA_1_1	F
2739	elkT-abcA_1_1	R
2740	I-cadA_1_1	F
2741	I-cadA_1_1	R
2742	albA_1_1	F

SEQ ID NO	Probe name	Direction
2743	albA_1_1	R
2744	wzm_1_1	F
2745	wzm_1_1	R
2746	msrCb_1_1	F
2747	msrCb_1_1	R
2748	nov_1_1	F
2749	nov_1_1	R
2750	wzt_1_1	F
2751	wzt_1_1	R
2752	wbbl_1_1	F
2753	wbbl_1_1	R
2754	norA23_1_1	F
2755	norA23_1_1	R
2756	mexR_1_1	F
2757	mexR_1_1	R
2758	arr2_1_1	F
2759	arr2_1_1	R
2760	mreA_1_1	F
2761	mreA_1_1	R
2762	I-cadC_1_1	F
2763	I-cadC_1_1	R
2764	uvrA_1_1	F
2765	uvrA_1_1	R
2766	CRD2_1_1	F
2767	CRD2_1_1	R
2768	CDR1_1_1	F
2769	CDR1_1_1	R
2770	CDR1_2_1	F
2771	CDR1_2_1	R
2772	MET3_1_1	F
2773	MET3_1_1	R
2774	FET3_1_1	F
2775	FET3_1_1	R
2776	FTR2_1_1	F
2777	FTR2_1_1	R
2778	MDR1-7_1_1	F
2779	MDR1-7_1_1	R
2780	ERG11_1_1	F
2781	ERG11_1_1	R
2782	SEC20_1_1	F
2783	SEC20_1_1	R
2784	rbcL_1_1	F
2785	rbcL_1_1	R
2786	LDHA(hu)_1_1	F

SEQ ID NO	Probe name	Direction
2787	LDHA(hu)_1_1	R
2788	GAPD(hu)_1_1	F
2789	GAPD(hu)_1_1	R
2790	b-Act(hu)_1_1	F
2791	b-Act(hu)_1_1	R
2792	ARHGDIA(hu)_1_1	F
2793	ARHGDIA(hu)_1_1	R
2794	PGK1(hu)_1_1	F
2795	PGK1(hu)_1_1	R
2796	rbcL_1_2	F
2797	rbcL_1_2	R
2798	16SPa_1_1	F
2799	16SPa_1_1	R
2800	23SEfaecium_2_1	F
2801	23SEfaecium_2_1	R
2802	16SStrepyog_1_1	F
2803	16SStrepyog_1_1	R
2804	16SStrepneu_1_1	F
2805	16SStrepneu_1_1	R
2806	16SStrepagalactiae_1_1	F
2807	16SStrepagalactiae_1_1	R
2808	16SEfaecium_1_1	F
2809	16SEfaecium_1_1	R
2810	16SEfaecium_2_1	F
2811	16SEfaecium_2_1	R
2812	16SRNAEf_2_1	F
2813	16SRNAEf_2_1	R
2814	16SKpn_1_1	F
2815	16SKpn_1_1	R
2816	16SSa_3_1	F
2817	16SSa_3_1	R
2818	16SRNAEf_1_1	F
2819	16SRNAEf_1_1	R
2820	16SShominis_1_1	F
2821	16SShominis_1_1	R
2822	16SShaemolyt_1_1	F
2823	16SShaemolyt_1_1	R
2824	23SEfaecium_1_1	F
2825	23SEfaecium_1_1	R
2826	16SrRNAPrmi_1_1	F
2827	16SrRNAPrmi_1_1	R
2828	16SrRNAPrvu1_1_1	F
2829	16SrRNAPrvu1_1_1	R
2830	16SSa_1_1	F

SEQ ID NO	Probe name	Direction
2831	16SSa_1_1	R
2832	16SKlox_1_1	F
2833	16SKlox_1_1	R
2834	p53_1_1	F
2835	p53_1_1	R
2836	0135mihck_1_1	F
2837	0135mihck_1_1	R
2838	FAN_1_1	F
2839	FAN_1_1	R
2840	0270cap_1_1	F
2841	0270cap_1_1	R
2909	16SStrepdysgal_1_1	F
2910	16SStrepdysgal_1_1	R
2911	carO_1_1	F
2912	carO_1_1	R
2913	gacS_1_1	F
2914	gacS_1_1	R
2915	dhbA_1_1	F
2916	dhbA_1_1	R
2917	dhbB_1_1	F
2918	dhbB_1_1	R
2919	sid_1_1	F
2920	sid_1_1	R
2921	csuD_1_1	F
2922	csuD_1_1	R
2923	csuC_1_1	F
2924	csuC_1_1	R
2925	tnp-ACIBA_1_1	F
2926	tnp-ACIBA_1_1	R
2927	waaA-ACIBA_1_1	F
2928	waaA-ACIBA_1_1	R
2929	csuB_1_1	F
2930	csuB_1_1	R
2931	csuA_B_1_1	F
2932	csuA_B_1_1	R
2933	csuA_1_1	F
2934	csuA_1_1	R
2935	put1_1_1	F
2936	put1_1_1	R
2937	por_1_1	F
2938	por_1_1	R
2939	abc_1_1	F
2940	abc_1_1	R
2941	furACIBA_1_1	F

SEQ ID NO	Probe name	Direction
2942	furACIBA_1_1	R
2943	dec_1_1	F
2944	dec_1_1	R
2945	cysI_1_1	F
2946	cysI_1_1	R
2947	trpE_1_1	F
2948	trpE_1_1	R
2949	put3_1_1	F
2950	put3_1_1	R
2951	ompA-ACIBA_1_1	F
2952	ompA-ACIBA_1_1	R
2953	aacA4ENCL_1_1	F
2954	aacA4ENCL_1_1	R
2955	AdeR-ACIBA_1_1	F
2956	AdeR-ACIBA_1_1	R
2957	adeA-ACIBA_1_1	F
2958	adeA-ACIBA_1_1	R
2959	aac(6p)-lb7_1_1	F
2960	aac(6p)-lb7_1_1	R
2961	adeB-ACIBA_1_1	F
2962	adeB-ACIBA_1_1	R
2963	adeC-ACIBA_1_1	F
2964	adeC-ACIBA_1_1	R
2965	AdeS-ACIBA_1_1	F
2966	AdeS-ACIBA_1_1	R
2967	blaL2_1_1	F
2968	blaL2_1_1	R
2969	blaMIR-3_1_1	F
2970	blaMIR-3_1_1	R
2971	ampR_1_1	F
2972	ampR_1_1	R
2973	ampC-ENCL_1_1	F
2974	ampC-ENCL_1_1	R
2975	blaL1_1_1	F
2976	blaL1_1_1	R
2977	asr_1_1	F
2978	asr_1_1	R
2979	lacZ_1_1	F
2980	lacZ_1_1	R
2981	ehuS_1_1	F
2982	ehuS_1_1	R
2983	ehuV_1_1	F
2984	ehuV_1_1	R
2985	slyA_1_1	F

SEQ ID NO	Probe name	Direction
2986	slyA_1_1	R
2987	ORF165_1_1	F
2988	ORF165_1_1	R
2989	ehuU_1_1	F
2990	ehuU_1_1	R
2991	ehuT_1_1	F
2992	ehuT_1_1	R
2993	ORF295_1_1	F
2994	ORF295_1_1	R
2995	ehuA_1_1	F
2996	ehuA_1_1	R
2997	ORF400_1_1	F
2998	ORF400_1_1	R
2999	H+ATPase_1_1	F
3000	H+ATPase_1_1	R
3001	sulII_1_1	F
3002	sulII_1_1	R
3003	smeE_1_1	F
3004	smeE_1_1	R
3005	eE_1_1	F
3006	eE_1_1	R
3007	StmPr1_1_1	F
3008	StmPr1_1_1	R
3009	eD_2_1	F
3010	eD_2_1	R
3011	ppi_1_1	F
3012	ppi_1_1	R
3013	pmp-STEMA_1_1	F
3014	pmp-STEMA_1_1	R
3015	pam_1_1	F
3016	pam_1_1	R
3017	ORF4-STEMA_1_1	F
3018	ORF4-STEMA_1_1	R
3019	ORF2-STEMA_1_1	F
3020	ORF2-STEMA_1_1	R
3021	et_1_1	F
3022	et_1_1	R
3023	eF_1_1	F
3024	eF_1_1	R
3025	StmPr2_1_1	F
3026	StmPr2_1_1	R
3027	smeF4494_1_1	F
3028	smeF4494_1_1	R
3029	coa_3_1	F

SEQ ID NO	Probe name	Direction
3030	coa_3_1	R
3031	coa_2_2	F
3032	coa_2_2	R
3033	fasCAXStrdysg_1_1	F
3034	fasCAXStrdysg_1_1	R
3035	sloStrep_1_1	F
3036	sloStrep_1_1	R
3037	ydhK_1_1	F
3038	ydhK_1_1	R
3039	tetA-ACIBA_1_1	F
3040	tetA-ACIBA_1_1	R
3041	tetR-ACIBA_1_1	F
3042	tetR-ACIBA_1_1	R

Claims

1. An analytical device for direct identification and characterisation of microorganisms in a sample or clinical specimen, wherein the analytical device comprises species specific gene probes which are (i) selected from DNA sequences or partial DNA sequences of the microorganisms to be identified or DNA sequences complementary or homologous thereto, and (ii) have a length of at least 100 nucleotides (nt).

2. The analytical device of claim 1, which is a DNA coated bead, a set of DNA coated beads, or a DNA microarray, preferably a DNA microarray.

3. The analytical device of claim 1 or 2 which is suitable for species specific identification of one microbial strain or a plurality of microbial strains in clinical specimens comprising microbial strains, especially bacteria and/or fungi, and which furthermore allows differentiation of the target species from each other and from non-target-species contained in one sample comprising a plurality of microbial strains.

4. The analytical device of claim 3 which is suitable for species specific identification of microorganisms causing bacteremia, fungemia or sepsis in a clinical sample.

5. The analytical device of any one of claims 1 to 4, wherein the device is suitable for species specific identification of microorganisms selected from the group consisting of Staphylococci, *E. coli* and Candida sp., preferably for species specific identification of Staphylococci.

6. The analytical device of any one of claims 1 to 5, which is suitable for species specific identification of microorganisms selected from the group consisting of *Staphylococcus aureus, Escherichia coli,* CoNS (including *Staphylococcus epidermidis, Staphylococcus haemolyticus, Staphylococcus lugdunensis, Staphylococcus warneri, Staphylococcus saprophyticus*), *Streptococcus pneumoniae, Streptococcus pyogenes, Klebsiella pneumoniae, Klebsiella oxytoca, Pseudomonas aeruginosa, Streptococcus agalactiae, Streptococcus mutans, Enterococcus faecalis, Enterococcus faecium, Proteus mirabilis, Proteus vulgaris, Candida albicans, Acinetobacter baumannii.*

7. The analytical device of claim 6, wherein the device is suitable for species specific identification of at least *S. aureus* and preferably comprises gene probes

selected from SEQ ID NO:3-6, 31, 40, 50, 51, 58, 59, 63, 64, 66-69, 71, 74, 76, 77, 79, 2902 and 2903, more preferably from SEQ ID NO:4, 68, 69 and 71, even more preferably comprises at least SEQ ID NO:71.

8. The analytical device of claim 6 or 7, wherein the device is suitable for species specific identification of at least *S. aureus, E. coli,* CoNS, Enterococcus sp., and/or Candida sp., and preferably comprises gene probes selected from

a) SEQ ID NO:4, 68, 69 and 71, preferably SEQ ID NO: 71 for identification of *S. aureus*;

b) SEQ ID NO: 145, 160, 161 and 170, preferably SEQ ID NO:145 for identification of *E. coli*;

c) SEQ ID NO:177, 178 and 190, preferably SEQ ID NO:178 for identification of *S. epidermidis*;

d) SEQ ID NO:60, 61, 70, 72, 78 and 125, preferably SEQ ID NO:78 for identification of the genus Staphylococci including *S. aureus*;

e) SEQ ID NO:210, 224 and 2906, preferably 2906 for identification of CoNS;

f) SEQ ID NO:308, 310 and 314, preferably SEQ ID NO:310 for identification of *Enterococcus faecalis;*

g) SEQ ID NO:380 and 385, preferably SEQ ID NO:380 for identification of *Enterococcus faecium;*

h) SEQ ID NO:232 and 249, preferably SEQ ID NO:249 for identification of *Candida albicans;*

respectively.

9. The analytical device of claim 8, which is suitable for species specific detection or differentiation of

(i) *S. aureus* and comprises SEQ ID NO:71;

(ii) CoNS and comprises SEQ ID NO:2906;

(iii) E. coli and comprises SEQ ID NO:145; and/or

(iv) *Candida albicans* and comprises SEQ ID NO:249.

10. The analytical device of any one of claims 7 to 9, which is suitable for additional species specific identification or differentiation of one or more of *Klebsiella pneumoniae, Klebsiella oxytoca, Streptococcus pneumoniae, Streptococcus pyogenes, Pseudomonas aeruginosa, Proteus mirabilis* and *Proteus vulgaris.*

11. The analytical device of any one of claims 1 to 10, which additionally comprises virulence and/or resistance gene probes.

12. The analytical device of any one of claims 1 to 11, wherein

(i) the length of the gene probes is from 100 to 1000 nt, preferably from 200 to 800 nt; and/or

(ii) specific gene probes are present for each specific microbial species or group of microorganisms to be identified or differentiated, which gene probes preferably are DNA sequences selected from the groups consisting of (a) species specific gene probes, (b) virulence gene probes and (c) resistance gene probes; and/or

(iii) the sample is selected from whole blood, serum, urine, saliva, liquor, sputum, punktate, stool, pus, wound fluid, swabs, positive blood cultures, preferably is positive blood cultures; and/or

(iv) the device further comprises DNA sequences selected from the group (d) consisting of control gene probes coding for negative controls and positive controls.

13. The analytical device of claim 3, which is suitable for diagnosis of

(i) bacteremia, fungemia or sepsis, wherein the device preferably comprises probes for species specific identification of at least *S. aureus, E. coli,* CoNS, Enterococcus sp., and Candida sp.;

(ii) respiratory tract infections, wherein the device preferably comprises probes for species specific identification of at least Candida sp., *S. aureus* and *P. aeruginosa*; and/or

(iii) urinary tract infenctions, wherein the device preferably comprises probes for species specific identification of at least *E. coli*, Enterococci sp., Candida sp. and Proteus sp..

14. The analytical device of any one of claims 1 to 13, wherein the set of gene probes preferably comprises gene probes selected from

(a) species specific gene probes for

(i) *Staphylococcus aureus* including gene probes derived from from *clfA, clfB, coa, lytM, NAG, sodA, sodB, epiP-bsaP, geh, hemC, hemD, hsdS, lip, menC, nuc, SAV0431, SAV0440, SAV0441, spa, ebpS, fbpA, fib, fnbB, srtA, fnbA, femA, fmhB, fmhA*;

(ii) *Escherichia coli* including gene probes derived *b1169, fliCb, nfrB, yacH, ycdS, yciQ, shuA;*

(iii) *Staphylococcus epidermidis* including gene probes derived from *ardeSE0106, ardeSE0107, atlE, agrB, alphSE1368, gad, glucSE1191, icaB, mvaSSepid, nitreSE1972, nitreSE1974, nitreSE1975, oiamtSE1209, ORF1Sepid, ORF3bSepid, qacR, ureSE1865, ureSE1867;*

(iv) *Staphylococcus haemolyticus* including gene probes derived from *femBShaemolyt, mvaDShaemolyt, mvaSShaemolyticus, RNApolsigm;*

(v) *Staphylococcus lugdunensis* including gene probes derived from *agrB2Stalugd, agrC2Stalugd, slamStalugd;*

(vi) *Staphylococcus warneri* including gene probes derived from *msrw1Stwar, nukMStwar, proDStwar, proMStwar, sigrpoStwar, tnpStwar;*

(vii) *Staphylococcus saprophyticus* including gene probes derived from *RNApolsigmSsapro;*

(viii) *Staphylococcus hominis* including gene probes derived from *ydhK;*

(ix) *Candida albicans* including gene probes derived from *ARG56, ASL43f, BGL2, CCT8, CDC37, CEF3, CHS1, CHS2, CHS4, CHS5, CHT1, CHT2, CHT4, CSA1, 5triphosphatase, AAF1, ADH1, ALS1, ALS7, EDT1, ELF, ESS1, FAL1, GAP1, GNA1, GSC1, GSL1, HIS1, HTS1, HWP1, HYR1, INT1a, KRE15f, KRE6, KRE9, MIG1, MLS1, MP65, NDE1, PFK2, PHR1, PHR2, PHR3, PRA1, PRS1, RBT1, RBT4, RHO1, RNR1, RPB7, RPL13, RVS167, SHA3, SKN1, SRB1, TCA1, TRP1, YAE1, YRB1, YST1exon2;*

(x) *Enterococcus faecalis* including gene probes derived from *arcA, arcC, bkdA, camE1, csrA, dacA, dfr, dhoD1a, ABC-eltA, agrBfs, agrCfs, dnaE, ebsA, ebsB, eep, efaR, gls24_glsB, gph, gyrAEf, metEf, mntHCb2, mob2, mvaD, mvaE, parC, pcfG, phoZ, polC, ptb, recS1, rpoN, tms, tyrDC, tyrS;*

(xi) *Enterococcus faecium* including gene probes derived from *bglB, bglR, bglS, efmA, efmB, efmC, mreC, mreD, mvaDEfaecium, mvaEEfaecium, mvaK1Efaecium, mvaK2Efaecium, mvaSEfaecium, orf3_4Efaeciumb, orf6_7Efaecium, orf7_8Efaecium, orf9_10Efaecium;*

(xii) *Klebsiella pneumonia* including gene probes derived from *atsA, budC, citA, citW, citX, dalK, acoA, acoB, acoC, ahlK, fimK, glfKPN2, ltrA, mdcC, mdcH, , nifF, nifK, nifN, tyrP, wbbO, wzb, wzmKPN2, wztKPN2, yojH, liac;*

(xiii) *Klebsiella oxytoca* including gene probes derived from *gatY, pelX, tagH, tagK, tagT;*

(xvi) *Pseudomonas aeruginosa* including gene probes derived from *glpR, lasRb, OrfX, pa0260, pa0572, pa0625, pa0636, pa1046, pa1069, pa1846, pa3866, pa4082, pilAp, PilAp2, pilC, PstP, uvrDII, vsmI, vsmR, xcpX;*

(xv) *Streptococcus pneumoniae* including gene probes derived from *cap1EStrpneu, cap1FStrpneu, cap1GStrpneu, cap3AStrpneu, cap3BStrpneu, celAStrpneu, celBStrpneu, cglAStrpneu, cglBStrpneu, cglCStrpneu, cglDStrpneu, cinA, cps14EStrpneum, cps14FStrpneum, cps14GStrpneum, cps14HStrpneum, cps19aHStrpneum, cps19aIStrpneum, cps19aKStrpneum, cps19fGStrpneum, cps23fGStrpneum, dexB, dinF, 1760Strpneu, acyPStrpneu, endAStrpneu, exoAStrpneu, exp72, fnlAStrpneu, fnlBStrpneu, fnlCStrpneu, gct18Strpneum, hexB1, hftsHstrpneu, immunofrag1Strpneu, immunofrag2Strpneu, immunofrag3Strpneu, kdtBStrpneu, lysAStrpneu, pcpBStrpneu, pflCStrpneu, plpA, prtA1Strpneu, pspC1Strpneu, pspC2, purRStrpneu, pyrDAStrpneum, SP0828Strpneu, SP0830Strpneu, SP0833Strpneu, SP0837_38Strpneu, SP0839Strpneu, ugdStrpneu, uncC, vicXStrepneu, wchA6bStrpneum, wci4Strpneum, wciK4Strpneum, wciL4Strpneum, wciN6bStrpneum, wciO6b-Strpneum, wciP6bStrpneum, wciY18Strpneum, wzdbStrpneum, wze6bStrpneum, wzy18Strpneum, wzy4Strpneum, wzy6bStrpneum, xpt;*

(xvi) *Streptococcus agalactiae* including gene probes derived from *cpsA1Strgal, cpsB1Strgal, cpsC1Strgal, cpsD1Strgal, cpsE1Strgal, cpsG1Strgal, cpsIStragal, cpsJStragal, cpsKStragal, cpsMStragal, cpsYStragal, cylBStraga, cylEStraga, cylFStraga, cylHStraga, cylIStraga, cylJStraga, cylKStraga, 0487Straga, 0488Straga, 0493Straga, 0495Straga, 0498Straga, 0500Straga, 0502Straga,* *0504Straga, folDStraga, neuA1Strgal, neuB1Strgal, neuC1Strgal, neuD1Strgal, recNStraga, ileSStraga;*

(xvii) *Streptococcus pyogenes* including gene probes derived from *cyclStrpyog, fah_rph_hlo_Strpyog, int, int315.5, oppD, , SpyM3_1351, vicXStrpyog;*

(xviii) *Streptococcus mutans* including gene probes derived from *573Stprmut, 580SStprmut, 581_582SStprmut, 584SStprmut, dltAStrmut, dltBStrmut, dltCppx1Strmut, dltDStrmut, lichStrbov, lytRStprmut, lytSStprmut, pepQStrrmut, pflCStrmut, recNStprmut, ytqBStrmut;*

(xix) *Proteus mirabilis* including gene probes derived from *atfA, atfB, atfC, ccmPrmi1, cyaPrmi, flfB, flfD, flfN, flhD, floA, ftsK, gstB, hemCPrmi, hemDPrmi, hev, katA, lpp1, menE, mfd, nrpA, nrpB, nrpG, nrpS, nrpT, nrpU, pat, pmfA, pmfC, pmfE, ppaA, rsbA, rsbC, speB, stmA, stmB, terA, umoA, umoB, umoC, ureR, xerC, ygbA;*

(xx) *Proteus vulgaris* including gene probes derived from *envZPrvu, frdC, frdD, lad, tna2*;

(xxi) *Acinetobacter baumanii* including gene probes derived from carO, gacS, dhbA, dhbB, sid, csuD, csuC, tnp-ACIBA, waaA-ACIBA, csuB, csuA_B, csuA, put1, por, abc, furACIBA, dec, cysI, trpE, put3, ompA-ACIBA; and/or

(b) virulence gene probes for

(i) *Staphylococcus aureus* including gene probes derived from *bsaE, bsaG, cap5h, cap5i, cap5j, cap5k, cap8H, cap8I, cap8J, cap8K, I-hld, I-hysA, I-IgGbg, EDIN, eta, etb, hglA, hglB, hglC, hla, hlb, lukF, lukS, NAG, sak, sea, seb, sec1, seg, seh, sel, set15, set6, set7, set8, sprV8, tst, I-sdrC, I-sdrD, I-sdrE;*

(ii) *Escherichia coli* including gene probes derived from *b1202, eae, eltB, escR, escT, escU, espB, fes, fteA, hlyA, hlyB, iucA, iucB, iucC, papG, rfbE, shuA, SLTII, toxA-LTPA, VT2vaB;*

(iii) *Staphylococcus epidermidis* including gene probes derived from *gcaD, hld_orf5, icaC, icaD, icaR, psm_beta1and2, purR, spoVG, yabJ;*

(iv) *Staphylococcus haemolyticus* including gene probes derived from *lipShaemolyt;*

(v) *Staphylococcus lugdunensis* including gene probes derived from *fblStalugd, slushABCStalugd;*

(vi) *Staphylococcus warneri* including gene probes derived from *gehAStwar;*

(vii) *Candida albicans* including gene probes derived from *CCN1, CDC28, CLN2, CPH1, CYB1, EFG1, MNT1, RBF1, RBF1, RIM101, RIM8, SEC14, SEC4, TUP1, YPT1, ZNF1CZF1;*

(viii) *Enterococcus faecalis* including gene probes derived from *asa1, asp1, cgh, cylA, cylB, cylI, cylL_cylS, cylM, ace, ef00108, ef00109, ef0011, ef00113, ef0012, ef0022, ef0031, ef0032, ef0040, ef0058, enlA, esa, esp, gelE, groEL, groES, rt1, sala, salb, sea1, sep1, vicK, yycH, yycI, yycJ;*

(ix) *Enterococcus faecium* including gene probes derived from *entA_entI, entD, entR, oep, sagA;*

(x) *Klebsiella pneumoniae* including gene probes derived from *cim, aldA, hemly, pSL017, pSL020, rcsA, rmlC, rmlD, waaG, wbbD, wbbM, wbbN, wbdA, wbdC, wztKpn, yibD;*

(xi) *P. aeruginosa* including gene probes derived from *aprA, aprE, ctx, algB, algN, algR, ExoS, fpvA, lasRa, lipA, lipH, Orf159, Orf252, pchG, PhzA, PhzB, PLC, plcN, plcR, pvdD, pvdF, pyocinS1, pyocinS1im, pyocinS2, pys2, rbf303, rhlA, rhlB, rhlR, TnAP41, toxA;*

(xii) *Streptococcus pneumoniae* including gene probes derived from *igaStrpneu, lytA, nanA, nanBStrpneu, pcpCStrpneu, ply, prtAStrpneu, pspA, SP0834Strpneu, sphtraStrpneu, wciJStrpneu, wziyStrpneu, wzxStrpneu;*

(xiii) *Streptococcus agalactiae* including gene probes derived from *CAMPfactor, 0499Straga, hylStragal, lipStragal;*

(xiv) *Streptococcus pyogenes* including gene probes derived from *DNaseIStrpyog, fba2Strpyog, fhuAStrpyog, fhuB1Strpyog, fhuDStrpyog, fhuGStrpyog, hylA, hylP, hylp2, oppB, ropB, scpAStrpyog, sloStrpyog, smez- Strpyog, sof, speA, speB2Strpyog, speCStrpyog, speJStrpyog, srtBStrpyog, srtCStrpyog, srtEStrpyog, srtFStrpyog, srtGStrpyog, srtIStrpyog, srtKStrpyog, srtRStrpyog, srtTStrpyog, vicKStrpyog;*

(xvi) *Streptococcus mutans* including gene probes derived from *hlyXStrmut, perMStrmut;*

(xvii) *Proteus mirabilis* including gene probes derived from *flaA, laD, fliA, hpmA, hpmB, lpsPrmi, mrpA, mrpB, mrpC, mrpD, mrpE, mrpF, mrpG, mrpH, mrpI, mrpJ, patA, putA, uca, ureDPrmi, ureEPrmi, ureFPrmi, zapA, zapB, zapD, zapE*; and/or

(c) resistance gene probes derived from genes coding for

(i) beta-lactams resistance including gene probes derived from *blaIMP-7, mecISepid, blaOXA-10, blaB, ampC, blaR, blaOXA-32, bla-CTX-M-22, pbp2aStrpneu, blaSHV-1, blaOXA-2, blaRShaemolyt, blaIMP-7, mecR, blaOXY, dacCStrpyog, femA, mecA, blaIShaemolyt, blavim, pbp2b, pbp2primeSepid, pbp2x, pbp3Saureuc, pbp4, pbp5Efaecium, pbpC, mecI, pbp1a, blaI, blaTEM-106, blaOXY-KLOX, ftsWEF, fmhB, cumA, blaPER-1, bla_FOX-3, blaA, psrb, fmhA, mecR1Sepid, blaZ, blaOXA-1, fox-6, blaPrmi;*

(ii) aminoglycosides resistance including gene probes derived from *aacA_aphDStwar, aacC1, aacC2, strB, aadA, aadB, aadD, aacA4, strA, aph-A3, aacC1, aacA4, aacA-aphD, I-spc, aphA3, ; aacA4ENCL, aac(6p)-lb7;*

(iii) macrolides-lincosamines-streptogramins resistance including gene probes derived from *ermC, linB, satSA, mdrSA, I-linA, ermB, ermA, satA, msrA, mphBM, mefA, mrx;*

(iv) trimethoprim resistance including gene probes derived from *dfrA, dfrStrpneu;*

(v) chloramphenicol resistance including gene probes derived from *cat, catEfaecium, cmlA5;*

(vi) tetracyclines resistance including gene probes derived from *tetAJ, tetL, tetM;*

(vii) glycopeptides resistance including gene probes derived from *vanH(tn), vanA, vanHB2, vanR, vanRB2, vanS(tn), vanSB2, vanWB2, ddl, ble, vanXB2, vanY(tn), vanYB2, vanB, vanZ(tn), vanC-2, vanX(tn);*

(viii) multiple target resistance including gene probes derived from *acrB, mexB, I-qacA, sulI, sul, cadBStalugd, mexA, acrR, emeA, acrA, rtn, abcXStrpmut, qacEdelta1, elkT-abcA, I-cadA, albA, wzm, msrCb, nov, wzt, wbbl, norA23, mexR, arr2, mreA, I-cadC, uvrA, , AdeR-ACIBA, adeA-ACIBA, adeB-ACIBA, adeC-ACIBA, AdeS-ACIBA;*

(ix) fungicide resistance, especially *C. albicans* fungicide resistance, including gene probes derived from *CRD2, CDR1, MET3, FET3, FTR2, MDR1-7, ERG11, SEC20.*

15. The analytical device of any one of claims 1 to 14, wherein

(i) the device comprises the minimal number of species specific gene probes of group (a) as defined in claim 12 or 14 which is sufficient for species identification, preferably the device comprises at least 2 different gene probes per target species of group (a); and/or

(ii) the device comprises the minimal number of virulence gene probes of group (b) as defined in claim 12 or 14 which is sufficient for virulence determination, preferably at least 1 gene probe, more preferably at least 5 different gene probes per target species of group (b); and/or

(iii) the device comprises the minimal number of resistance gene probes of group (c) as defined in claim 12 or 14 which is sufficient for determination of resistance, preferably at least 1 gene probe, more preferably at least 5 different gene probes of group (c); and/or

(iv) the DNA sequences are selected from the group consisting of SEQ ID NOs 1-918 and 2842-2908, complementary sequences thereto, addition mutants, deletion mutants, substitution mutants and homologues thereof.

16. The analytical device of claim 15, wherein

(i) the gene probes of group (a) are selected from SEQ ID NO:SEQ ID NO:1-99, 142-152, 174-199, 209-214, 216-219, 222-229, 231-291, 308-342, 377-393, 399-431, 449-490, 523-591, 606-639, 645-656, 687-701, 706-749, 776-781, 2843-2863, 2902 and 2903;

(ii) the gene probes of group (b) are selected from SEQ ID NO:100-141, 153-173, 200-208, 215, 220-221, 230, 292-307, 343-376, 394-398, 432-448, 491-522, 592-605, 640-644, 657-686, 702-705, 750-775 and 782-784; and/or

(iii) the gene probes of group (c) are selected from SEQ ID NO:785-918, 2864-2875, 2888 and 2907-2908, preferably from SEQ ID NO:785-909, 2864-2875, 2888 and 2907-2908.

17. The analytical device of claim 15 or 16, which

(I) is suitable for identification of *Staphylococcus aureus* and comprises one or more or all of the gene probes selected from SEQ ID NO:3-6, 31, 40, 50, 51, 58, 59, 63, 64, 66-69, 71, 74, 76, 77, 79, 2902, 2903, preferably comprises at least one of the gene probes represented by SEQ ID NO:71, 68, 4 and 69; and/or

(II) is suitable for identification of *Escherichia coli* and comprises one or more or all of the gene probes selected from SEQ ID NO:142, 144, 145, 148, 150-152, 160, 161 and 170, preferably at least one of the gene probe represented by SEQ ID NO:145, 160, 161 and 170; and/or

(III) is suitable for identification of *Staphylococcus epidermidis* and comprises gene probes selected from SEQ ID NO:174, 175, 177, 178, 180-182, 185-193, 198 and 199, preferably at least one of the gene probes represented by SEQ ID NO:177, 178 and 190; and/or

(IV) is suitable for identification of *Staphylococcus haemolyticus* and comprises one or more or all of the gene probes selected from SEQ ID NO:211, 213 and 214, preferably at least one of the gene probes represented by SEQ ID NO:211 and 214; and/or

(V) is suitable for identification of *Staphylococcus lugdunensis* and comprises one or more or all of the gene probes selected from SEQ ID NO:216, 217 and 219-221, preferably at least one of the gene probes represented by SEQ ID NO:216, 219, 220 and 221; and/or

(VI) is suitable for identification of *Staphylococcus warneri* and comprises one or more or all of the gene probes selected from SEQ ID NO:224-228 and 230, preferably at least one of the gene probes represented by SEQ ID NO:224, 226, and 230; and/or

(VII) is suitable for identification of *Staphylococcus saprophyticus* and comprises one or more or all of the gene probes selected from SEQ ID NO:222 and 223; and/or

(VIII) is suitable for identification of *Staphylococcus hominis* and comprises one or more or all of the gene probes selected from SEQ ID NO:2096, 194, 229, 211 and 214; and/or

(IX) is suitable for identification of *Candida albicans* and comprises one or more or all of the gene probes selected from SEQ ID NO:231-291, preferably at least one of the gene probes represented by SEQ ID NO:232 and 249; and/or

(X) is suitable for identification of *Enterococcus faecalis* and comprises one or more or all of the gene probes selected from SEQ ID NO:308-310 and 312-342, preferably at least one of the gene probes represented by SEQ ID NO:308, 310 and 314; and/or

(XI) is suitable for identification of *Enterococcus faecium* and comprises one or more or all of the gene probes selected from SEQ ID NO:377-393, preferably at least one of the gene probes represented by SEQ ID NO:380 and 385; and/or

(XII) is suitable for identification of *Klebsiella pneumoniae* and comprises one or more or all of the gene probes selected from SEQ ID NO:399, 401-404, 408-415, 417, 420-423, 425 and 427-431, preferably at least one of the gene probes represented by SEQ ID NO:401, 410 and 430; and/or

(XIII) is suitable for identification of *Klebsiella oxytoca* and comprises one or more or all of the gene probes selected from SEQ ID NO:459 and 466-469, preferably at least one of the gene probes represented by SEQ ID NO:459, 468 and 469; and/or

(XIV) is suitable for identification of *Pseudomonas aeruginosa* and comprises one or more or all of the gene probes selected from SEQ ID NO:470-485, 487-493 and 505, preferably at least one of the gene probes represented by SEQ ID NO:471, 474, 488 and 505; and/or

(XV) is suitable for identification of *Streptococcus pneumoniae* and comprises one or more or all of the gene probes selected from SEQ ID NO:523-591, preferably at least one of the gene probes represented by SEQ ID NO:558 and 562; and/or

(XVI) is suitable for identification of *Streptococcus agalactiae* and comprises one or more or all of the gene probes selected from SEQ ID NO:606-639, preferably at least one of the gene probes represented by SEQ ID NO:606 and 619; and/or

(XVII) is suitable for identification of *Streptococcus pyogenes* and comprises one or more or all of the gene probes selected from SEQ ID NO:645-648, 652, 655-656, 658 and 660, preferably at least one of the gene probes represented by SEQ ID NO:645, 658 and 660; and/or

(XVIII) is suitable for identification of *Streptococcus mutans* and comprises one or more or all of the gene probes selected from SEQ ID NO:687-701, preferably at least one of the gene probes represented by SEQ ID NO:687, 691 and 692; and/or

(XIX) is suitable for identification of *Proteus mirabilis* and comprises one or more or all of the gene probes selected from SEQ ID NO:706-710, 712-742 and 744-749, preferably at least one of the gene probes represented by SEQ ID NO:721, 725 and 735; and/or

(XX) is suitable for identification of *Proteus vulgaris* and comprises one or more or all of the gene probes selected from SEQ ID NO:776-778 and 780-781, preferably at least one of the gene probes represented by SEQ ID NO:776, 777 and 781; and/or

(XXI) is suitable for identification of *Acinetobacter baumannii* and comprises one or more or all of the gene probes selected from SEQ ID NO:2843-2863, preferably at least one of the gene probes represented by SEQ ID NO:2858 and 2863.

18. The analytical device of claim 17, which further comprises

(I) for the characterisation of *Staphylococcus aureus:* one or more or all

of the gene probes of group (b) selected from SEQ ID NO:100-141, and/or

of the gene probes of group (c) selected from SEQ ID NO:785-909, 2864-2875, 2888, 2907-2908; and/or

(II) for the characterisation of *Escherichia coli*: one or more or all

of the gene probes of group (b) selected from SEQ ID NO:153-173, and/or

of the gene probes of group (c) selected from SEQ ID NO:785-909, 2864-2875, 2888, 2907-2908; and/or

(III) for the characterisation of *Staphylococcus epidermidis:* one or more or all

of the gene probes of group (b) selected from SEQ ID NO:200-208, and/or

of the gene probes of group (c) selected from SEQ ID NO:785-909, 2864-2875, 2888, 2907-2908; and/or

(IV) for the characterisation of *Staphylococcus haemolyticus*: one or more or all

of the gene probe of group (b) represented by SEQ ID NO:215, and/or

of the gene probes of group (c) selected from SEQ ID NO:785-909, 2864-2875, 2888, 2907-2908; and/or

(V) for the characterisation of *Staphylococcus lugdunensis*: one or more or all of the gene probes of group (b) selected from SEQ ID NO:220-221, and/or

of the gene probes of group (c) selected from SEQ ID NO:785-909, 2864-2875, 2888, 2907-2908; and/or

(VI) for the characterisation of *Staphylococcus warneri*: one or more or all

of the gene probe of group (b) represented by SEQ ID NO:230, and/or

of the gene probes of group (c) selected from SEQ ID NO:785-909, 2864-2875, 2888, 2907-2908; and/or

(VII) for the characterisation of *Staphylococcus saprophyticus*: one or more or all

of the gene probe of group (c) selected from SEQ ID NO:785-909, 2864-2875, 2888, 2907-2908; and/or

(VIII) for the characterisation of *Staphylococcus hominis*: one or more or all

of the gene probe of group (c) selected from SEQ ID NO:785-909, 2864-2875, 2888, 2907-2908; and/or

(IX) for the characterisation of *Candida albicans:* one or more or all

of the gene probes of group (b) selected from SEQ ID NO:292-307, and/or

of the gene probes of group (c) selected from SEQ ID NO:910-918; and/or

(X) for the characterisation of *Enterococcus faecalis:* one or more or all

of the gene probes of group (b) selected from SEQ ID NO:343-376, and/or

of the gene probes of group (c) selected from SEQ ID NO:785-909, 2864-2875, 2888, 2907-2908; and/or

(XI) for the characterisation of *Enterococcus faecium:* one or more or all

of the gene probes of group (b) selected from SEQ ID NO:394-398, and/or

of the gene probes of group (c) selected from SEQ ID NO:785-909, 2864-2875, 2888, 2907-2908; and/or

(XII) for the characterisation of *Klebsiella pneumonia:* one or more or all

of the gene probes of group (b) selected from SEQ ID NO:432-448, and/or

of the gene probes of group (c) selected from SEQ ID NO:785-909, 2864-2875, 2888, 2907-2908; and/or

(XIII) for the characterisation of *Klebsiella oxytoca:* one or more or all of the gene probes of group (c) selected from SEQ ID NO:785-909, 2864-2875, 2888, 2907-2908; and/or

(XIV) for the characterisation of *Pseudomonas aeruginosa:* one or more or all of the gene probes of group (b) selected from SEQ ID NO:491-522, and/or of the gene probes of group (c) selected from SEQ ID NO:785-909, 2864-2875, 2888, 2907-2908; and/or

(XV) for the characterisation of *Streptococcus pneumoniae*: one or more or all of the gene probes of group (b) selected from SEQ ID NO:592-605, and/or of the gene probes of group (c) selected from SEQ ID NO:785-909, 2864-2875, 2888, 2907-2908; and/or

(XVI) for the characterisation of *Streptococcus agalactiae:* one or more or all of the gene probes of group (b) selected from SEQ ID NO:640-644, and/or of the gene probes of group (c) selected from SEQ ID NO:785-909, 2864-2875, 2888, 2907-2908; and/or

(XVII) for the characterisation of *Streptococcus pyogenes:* one or more or all of the gene probes of group (b) selected from SEQ ID NO:657-686, and/or of the gene probes of group (c) selected from SEQ ID NO:785-909, 2864-2875, 2888, 2907-2908; and/or

(XVIII) for the characterisation of *Streptococcus viridans:* one or more or all of the gene probes of group (b) selected from SEQ ID NO:702-705, and/or of the gene probes of group (c) selected from SEQ ID NO:785-909, 2864-2875, 2888, 2907-2908; and/or

(XIX) for the characterisation of *Proteus mirabilis:* one or more or all of the gene probes of group (b) selected from SEQ ID NO:750-775, and/or of the gene probes of group (c) selected from SEQ ID NO:785-909, 2864-2875, 2888, 2907-2908; and/or

(XX) for the characterisation of *Proteus vulgaris:* one or more or all of the gene probes of group (b) selected from SEQ ID NO:782-784, and/or

of the gene probes of group (c) selected from SEQ ID NO:785-909, 2864-2875, 2888, 2907-2908.

(XXI) for the characterisation of *Acinetobacter baumannii:* one or more or all

of the gene probes of group (c) selected from SEQ ID NO:785-909, 2864-2875, 2888, 2907-2908.

19. Use of the analytical device of any one of claims 1-18 for *in vitro* identification and characterisation of microorganisms in a sample or in a clinical specimen, preferably for the diagnosis of a clinical condition, more preferably for the diagnosis of bacteremia, fungemia or sepsis.

20. Use of the analytical device of any one of claims 1-18 for *in vitro* differentiation of a plurality of different microbial strains contained in one sample and/or for species-specific identification of one or more microbial strain contained in a mixture of a plurality of microorganisms.

21. An *in vitro* method for identification and characterisation of microorganisms in a sample or in a clinical specimen comprising

(a) isolating the total DNA from the sample or clinical specimen and labelling the DNA with a reporter molecule;

(b) applying the DNA thus obtained to the analytical device of anyone of claims 1-18 and hybridising the DNA with the gene probes of the analytical device; and

(c) detecting DNA bound to the analytical device by determination of the amount of the reporter molecules bound to the device.

22. The method of claim 21,

(i) which is a method for diagnosis of bacteremia, fungemia or sepsis; and/or

(ii) wherein the clinical specimen is a positive blood culture; and/or

(iii) wherein the ratio of microbial DNA to total DNA isolated from said sample or clinical specimen is less than 100 %, preferably from 1% to 99%; and/or

(iv) wherein the reporter molecule is a fluorochrome; and/or

(v) wherein the determination of the amount of reporter molecules bound to the device is achieved by visualization of the reporter molecule; and/or

(vi) wherein the DNA isolated in step (a) is labelled and applied to the analytical device without prior amplification, preferably is labelled by random priming; and/or

(vii) wherein the DNA isolated in step (a) is fragmented before the labelling reaction.

23. The method of claim 21 or 22, wherein the analytical device is a DNA microarray and the detection is preferably performed using a DNA microarray reader.

24. The method of claim 21 or 22, wherein the analytical device is a DNA coated bead or a set of DNA coated beads, and the application and/or detection step is preferably performed in a microfluidic device.

25. A kit for detection of microorgamisms in a sample or clinical specimen comprising the analytical device of any one of claims 1 to 18.

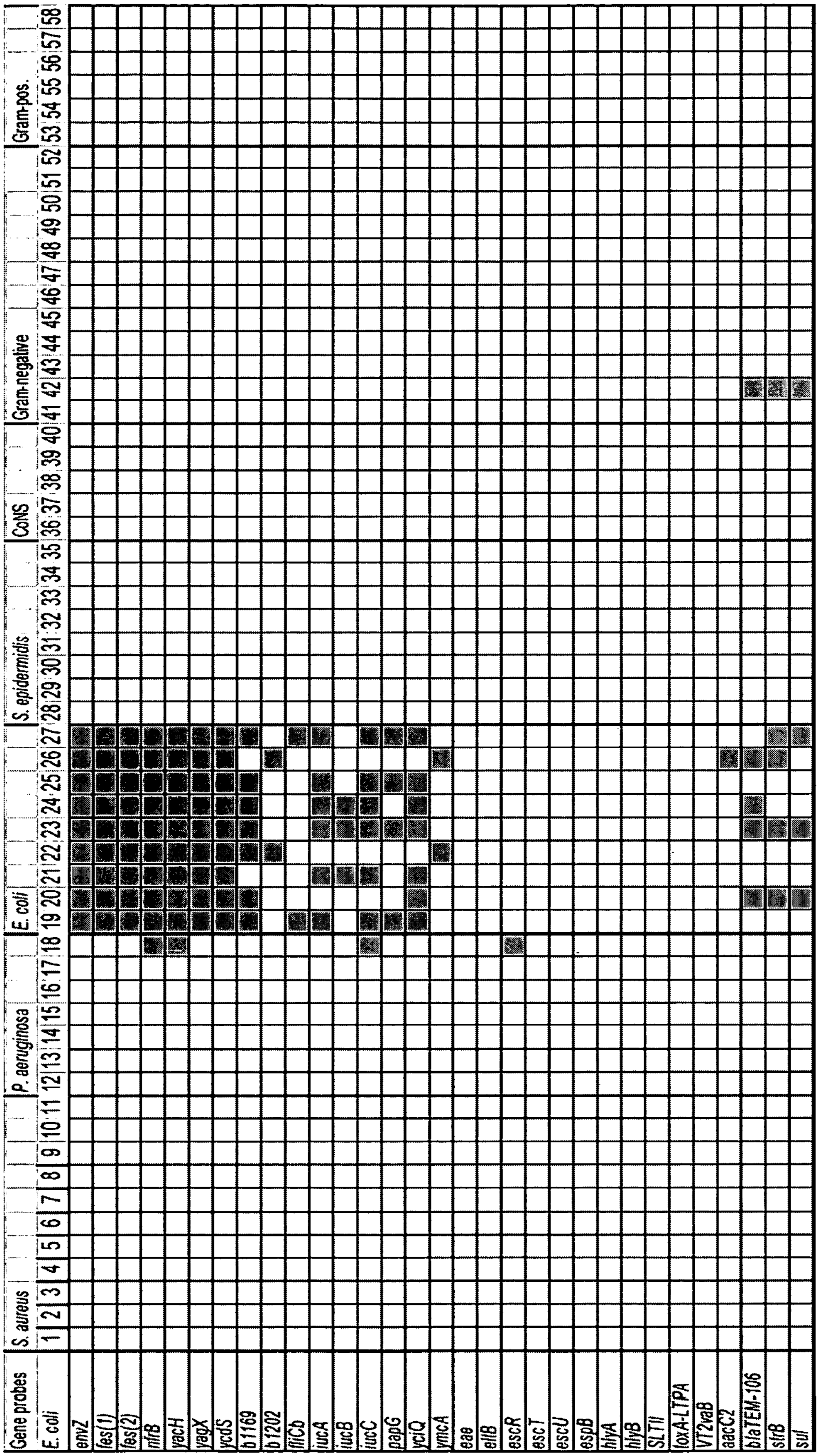
Gene probes
E. coli
S. aureus
P. aeruginosa
E. coli
S. epidermidis
CoNS
Gram-negative
Gram-pos.
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48 49 50 51 52 53 54 55 56 57 58
envZ
fes(1)
fes(2)
nfrB
yacH
yagX
ycdS
b1169
b1202
fliCb
iucA
iucB
iucC
papG
yciQ
ymcA
eae
eltB
escR
escT
escU
espB
hlyA
hlyB
SLTII
toxA-LTPA
VT2vaB
aacC2
blaTEM-106
strB
sul

Fig.1A

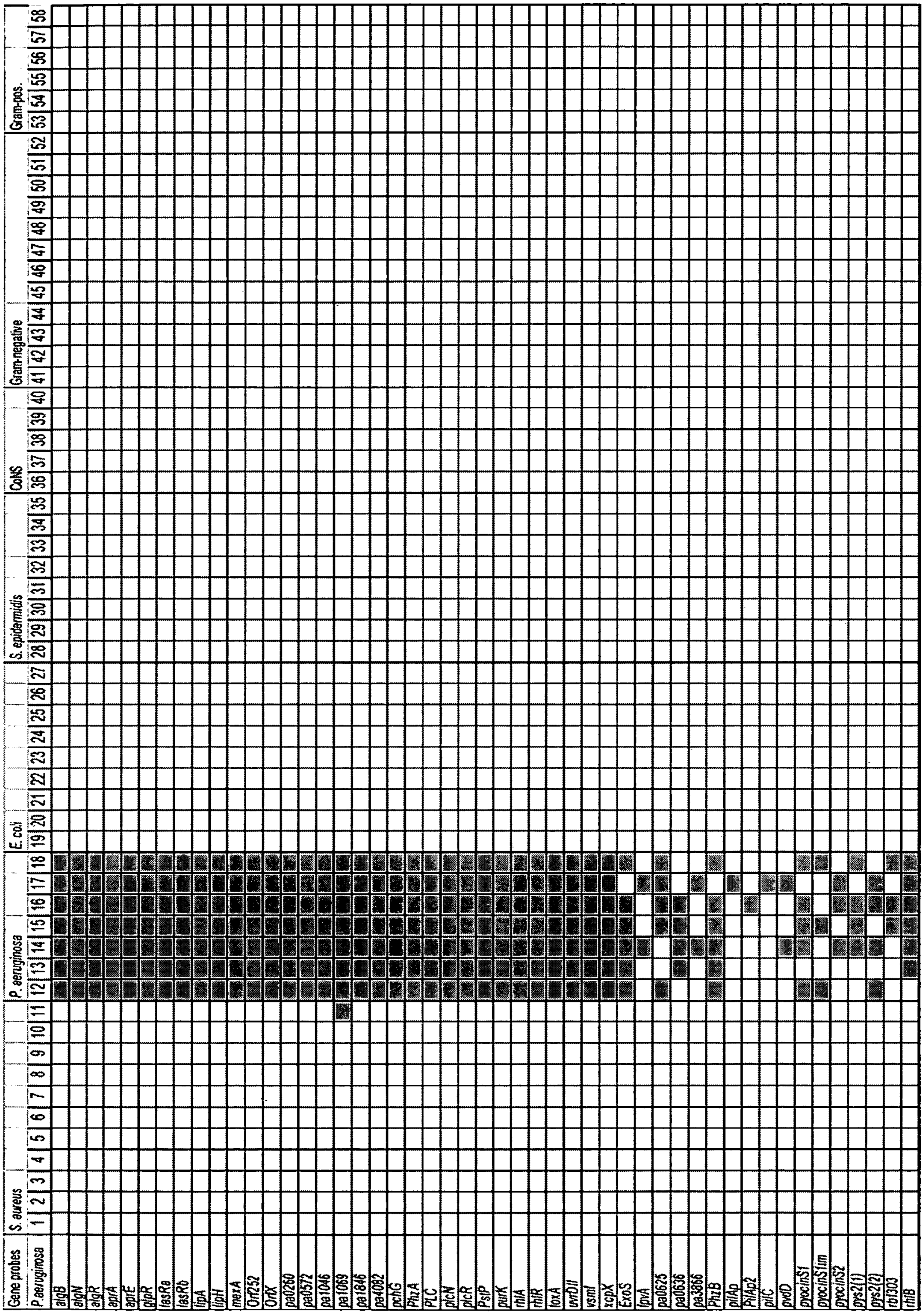
Gene probes
P. aeruginosa
S. aureus
E. coli
P. aeruginosa
S. epidermidis
CoNS
Gram-negative
Gram-pos.
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48 49 50 51 52 53 54 55 56 57 58
algB
algN
algR
aprA
aprE
glpR
lasRa
lasRb
lipA
lipH
mexA
Orf252
OrfX
pa0260
pa0572
pa1046
pa1069
pa1846
pa4082
pchG
PhzA
PLC
plcN
plcR
PslP
purK
rhlA
rhlR
toxA
uvrDII
vsmI
xcpX
ExoS
fpvA
pa0625
pa0636
pa3866
PhzB
pilAp
PilAp2
pilC
pvdD
pyocinS1
pyocinS1im
pyocinS2
pys2(1)
pys2(2)
rb1303
rhlB

Fig.1B

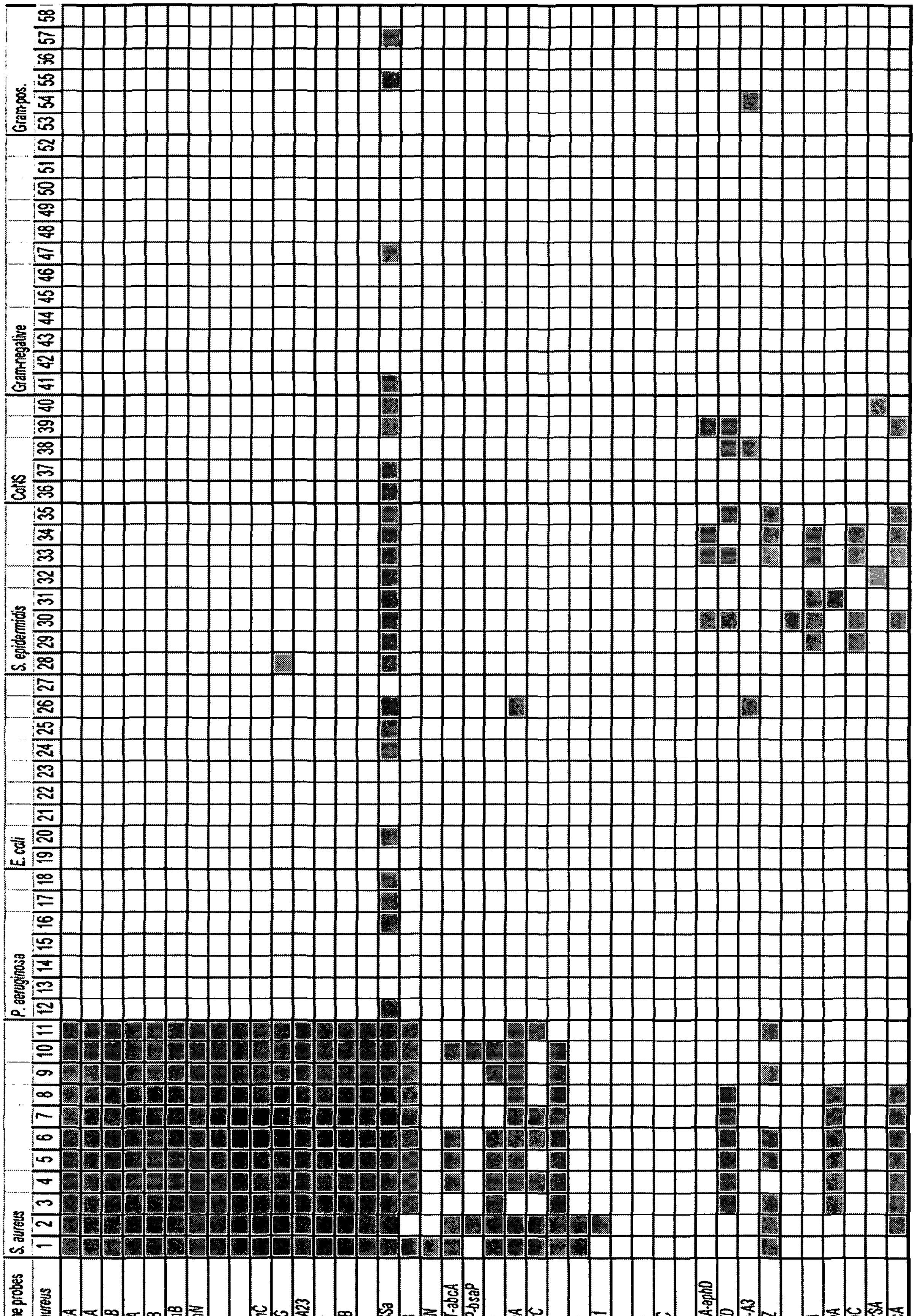
Gene probes
S. aureus
P. aeruginosa
E. coli
S. epidermidis
CoNS
Gram-negative
Gram-pos.
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48 49 50 51 52 53 54 55 56 57 58
femA
fmhA
fmhB
gyrA
gyrB
hemB
hemN
hla
lip
menC
NAG
norA23
nuc
rpoB
tag
16SSa
clfB
EDIN
etkT-abcA
epiP-bsaP
geh
mreA
murC
sak
sea
sec1
etb
seb
sstC
tst
aacA-aphD
aadD
aph-A3
blaZ
cat
dfrA
ermA
ermC
msrSA
mecA

Fig.1C

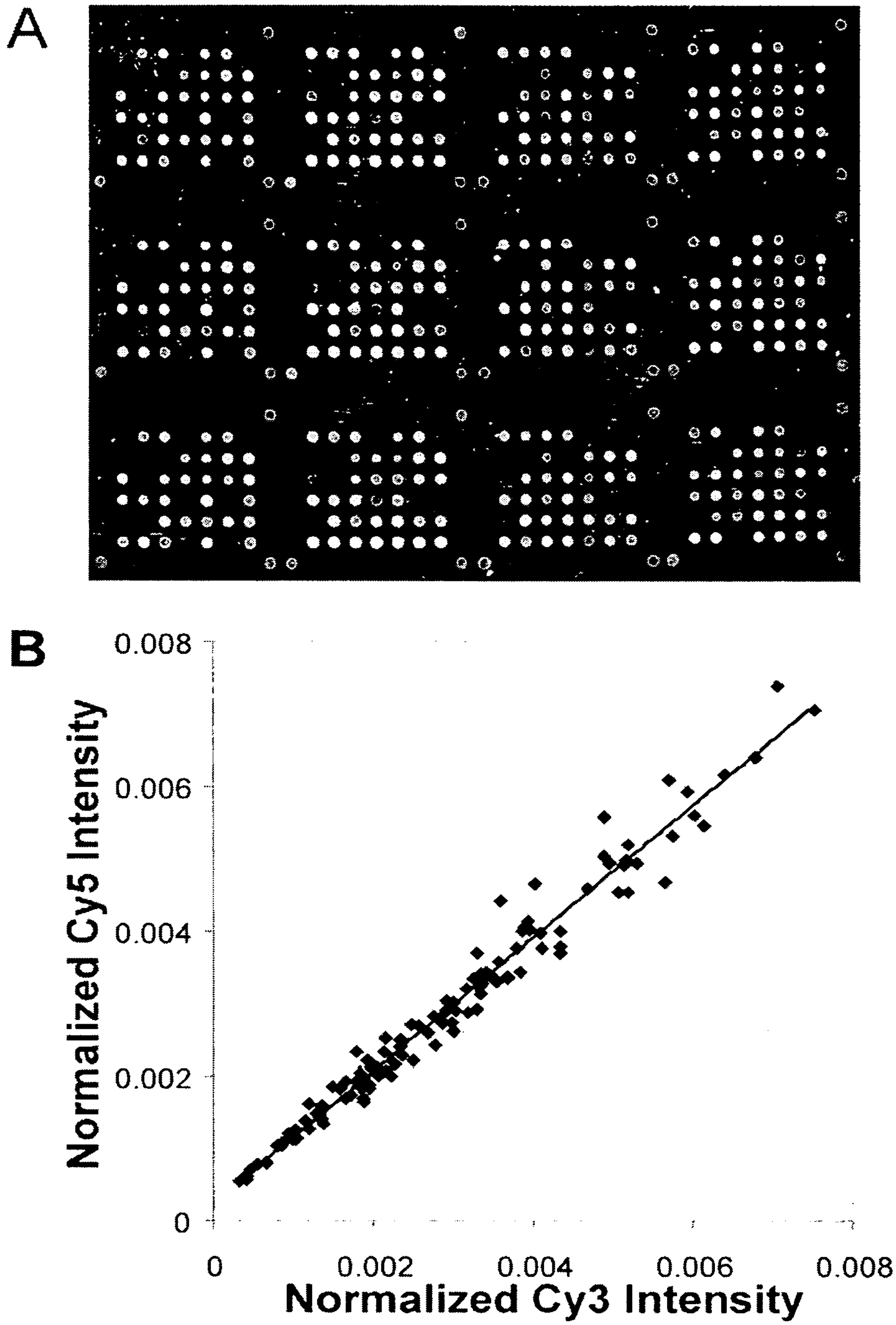
A
B
0.008
0.006
0.004
0.002
0
Normalized Cy5 Intensity
0
0.002
0.004
0.006
0.008
Normalized Cy3 Intensity

Fig.2

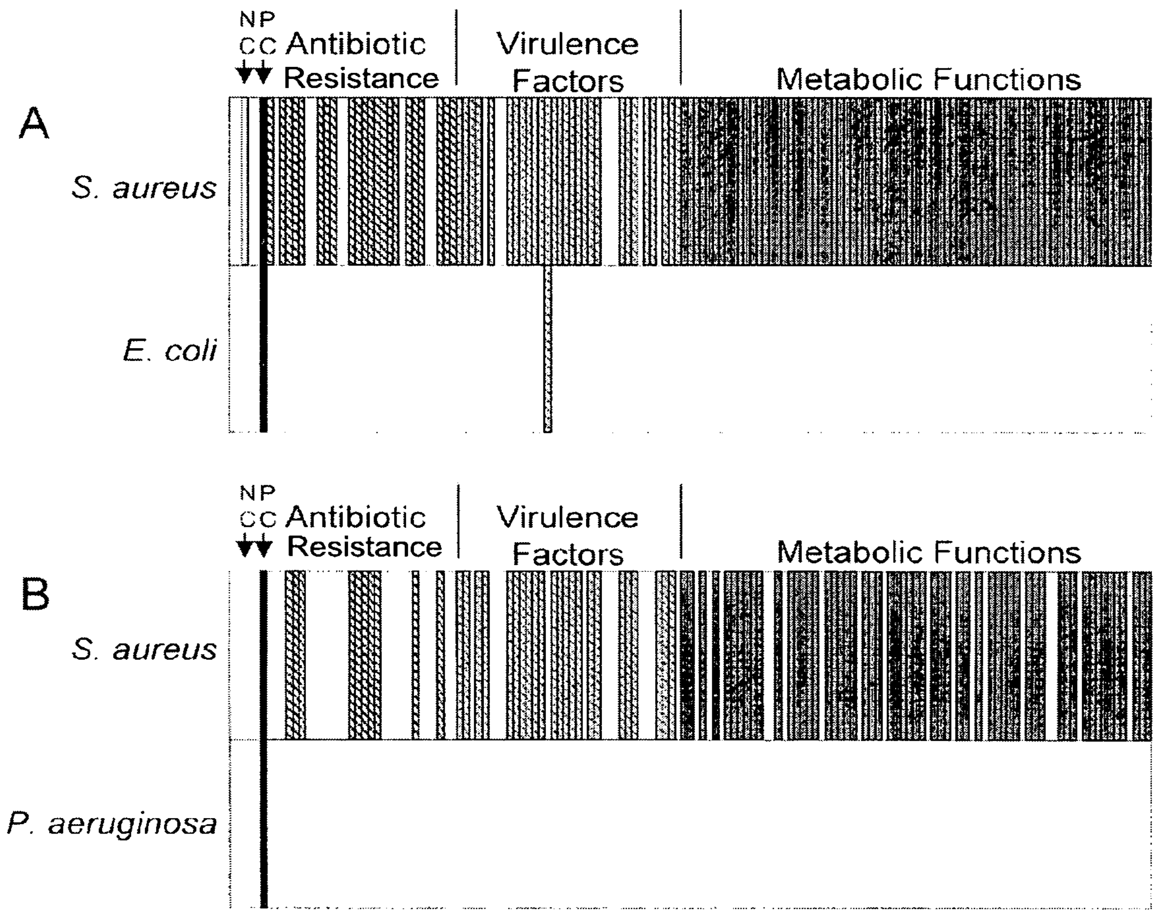
NC
PC
Antibiotic Resistance
Virulence Factors
Metabolic Functions
A
S. aureus
E. coli
NC
PC
Antibiotic Resistance
Virulence Factors
Metabolic Functions
B
S. aureus
P. aeruginosa

Fig.3

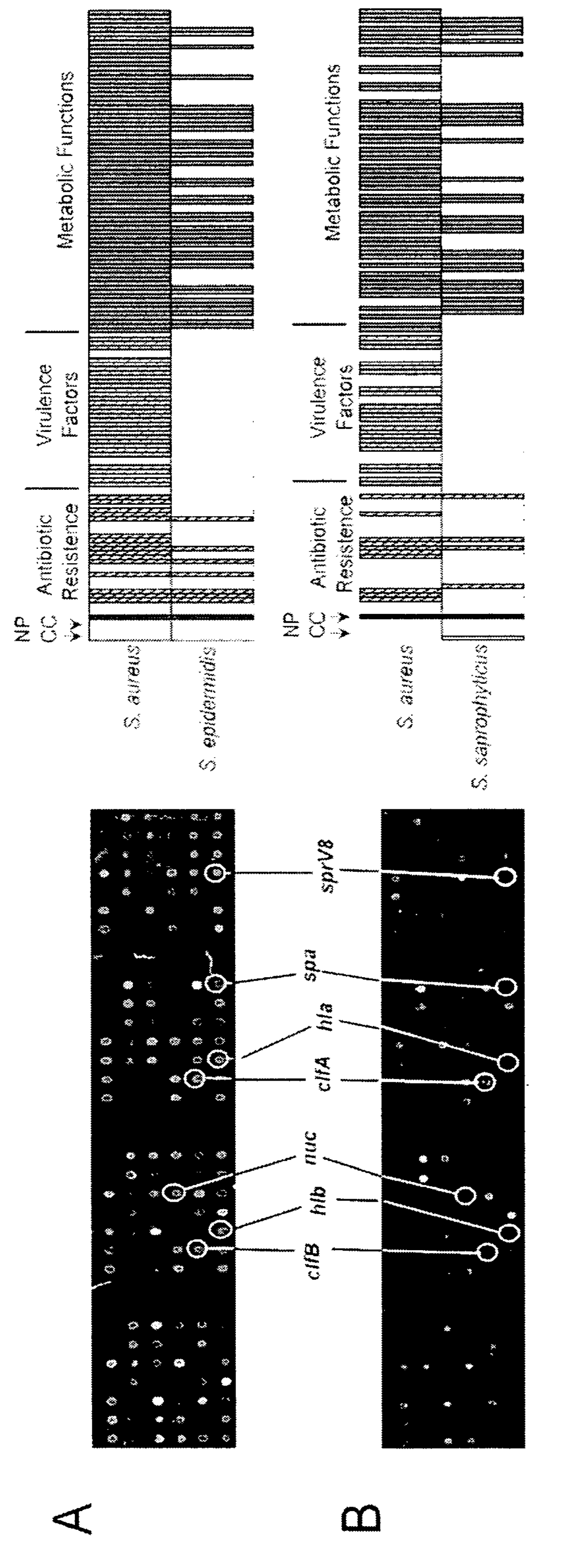
A
B
NP
CC
Antibiotic Resistence
Virulence Factors
Metabolic Functions
S. aureus
S. epidermidis
S. saprophyticus
sprV8
spa
hla
clfA
nuc
hlb
clfB

Fig.4

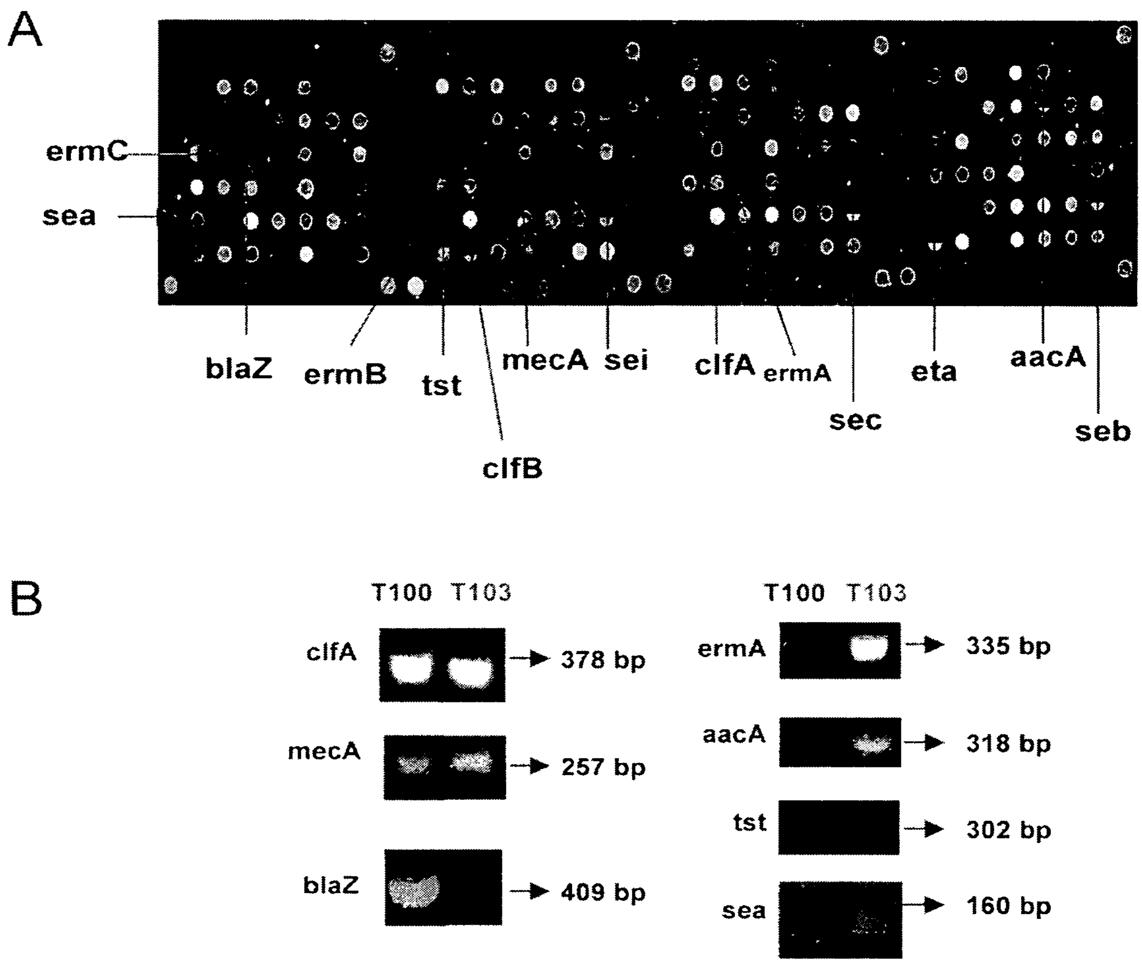
A
ermC
sea
blaZ
ermB
tst
clfB
mecA
sei
clfA
ermA
sec
eta
aacA
seb
B
T100 T103
clfA
378 bp
mecA
257 bp
blaZ
409 bp
T100 T103
ermA
335 bp
aacA
318 bp
tst
302 bp
sea
160 bp

Fig.5

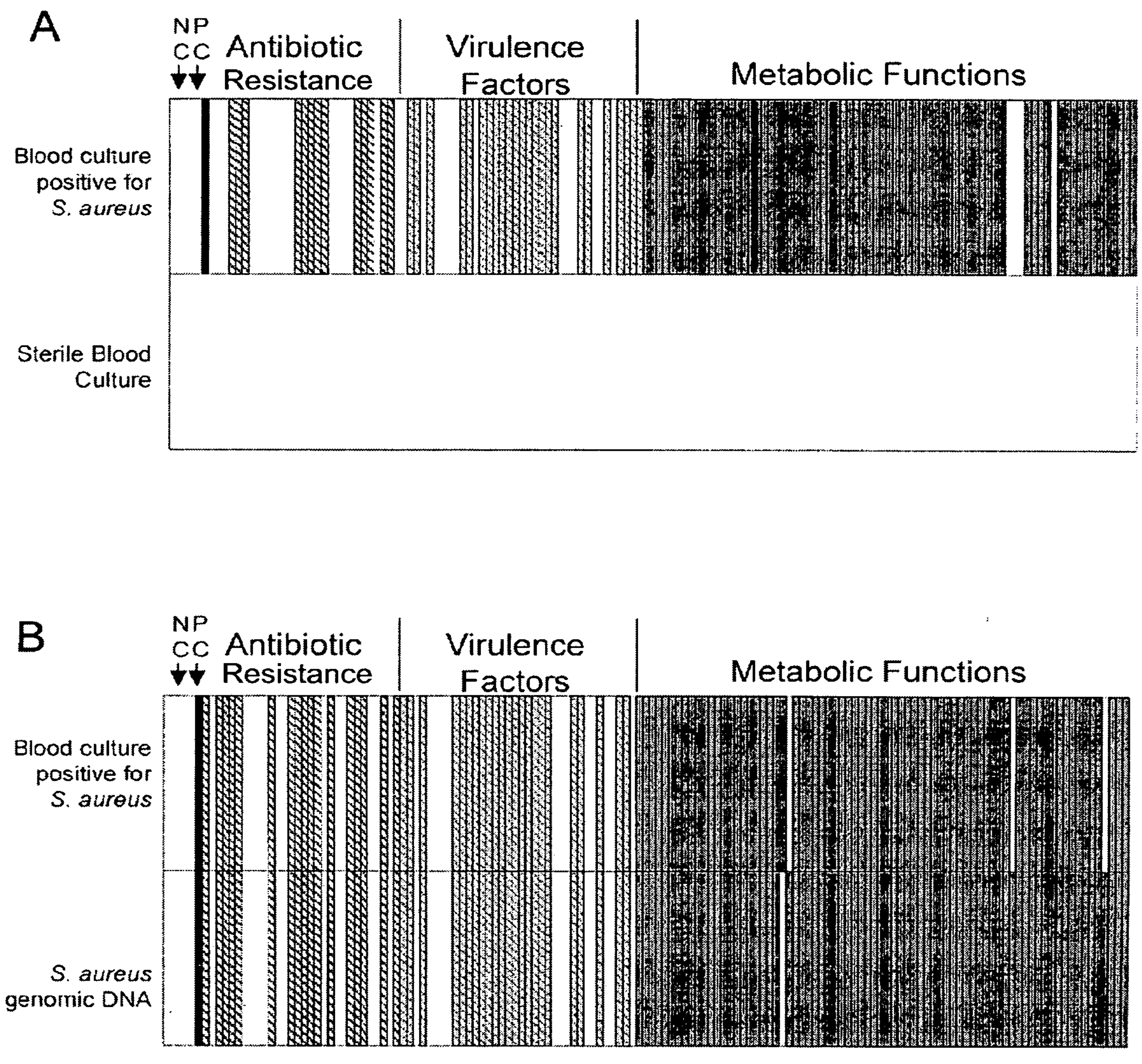
A
NP
CC
Antibiotic Resistance
Virulence Factors
Metabolic Functions
Blood culture positive for S. aureus
Sterile Blood Culture
B
NP
CC
Antibiotic Resistance
Virulence Factors
Metabolic Functions
Blood culture positive for S. aureus
S. aureus genomic DNA

Fig.6

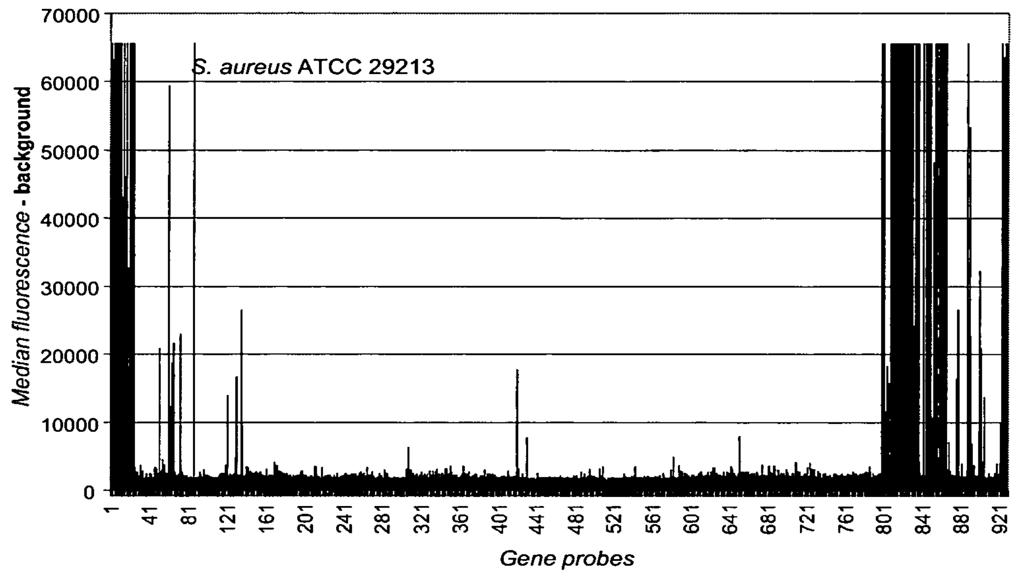
S. aureus ATCC 29213
Median fluorescence - background
70000
60000
50000
40000
30000
20000
10000
0
1
41
81
121
161
201
241
281
321
361
401
441
481
521
561
601
641
681
721
761
801
841
881
921
Gene probes

Fig.7A

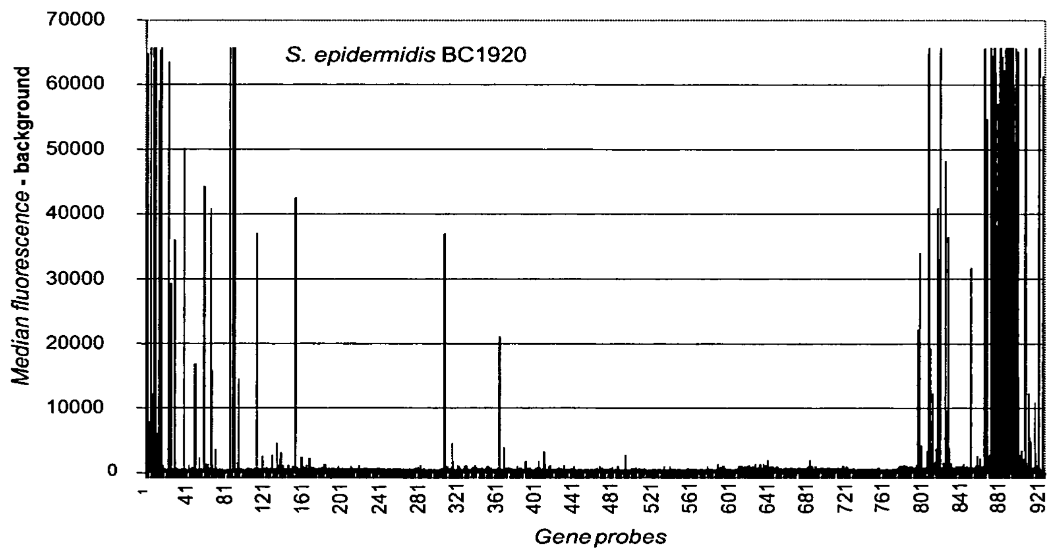
S. epidermidis BC1920
Median fluorescence - background
70000
60000
50000
40000
30000
20000
10000
0
1
41
81
121
161
201
241
281
321
361
401
441
481
521
561
601
641
681
721
761
801
841
881
921
Gene probes

Fig.7B

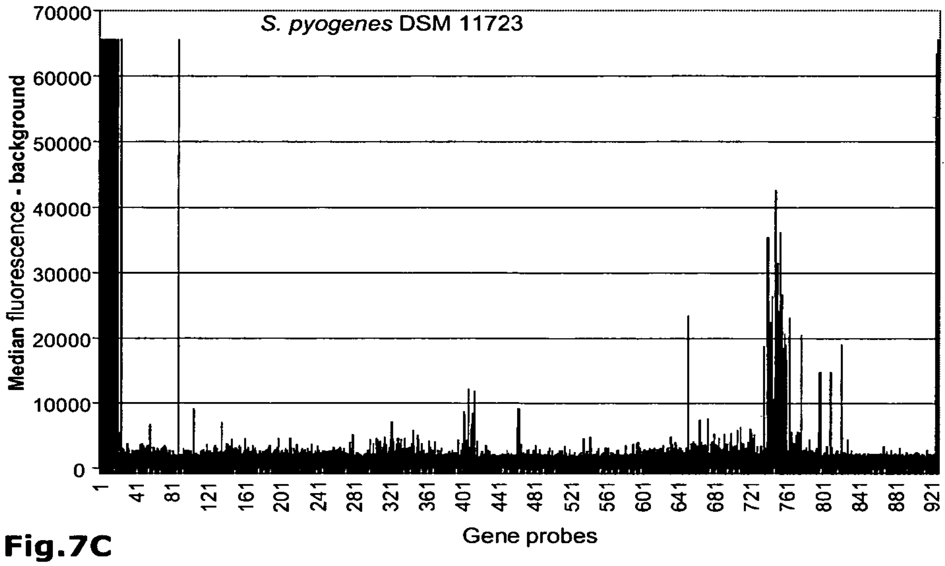
S. pyogenes DSM 11723
70000
60000
50000
40000
30000
20000
10000
0
Median fluorescence - background
1 41 81 121 161 201 241 281 321 361 401 441 481 521 561 601 641 681 721 761 801 841 881 921
Gene probes

Fig.7C

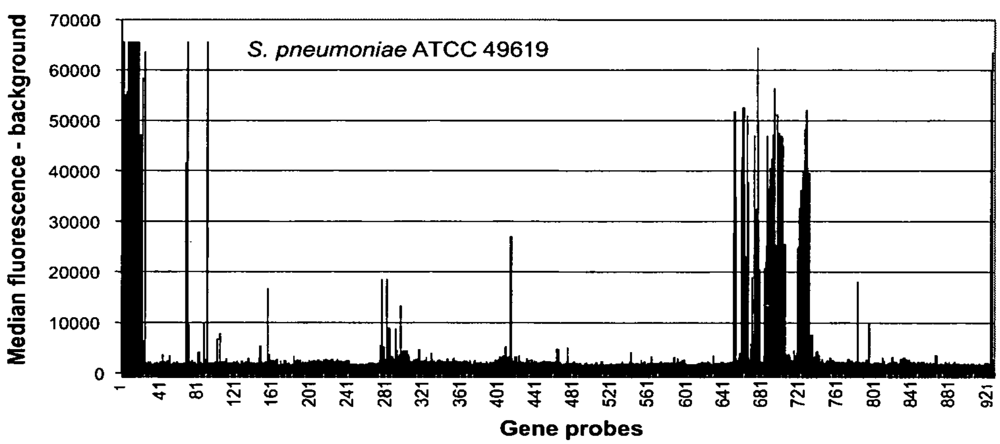
S. pneumoniae ATCC 49619
70000
60000
50000
40000
30000
20000
10000
0
Median fluorescence - background
1 41 81 121 161 201 241 281 321 361 401 441 481 521 561 601 641 681 721 761 801 841 881 921
Gene probes

Fig.7D

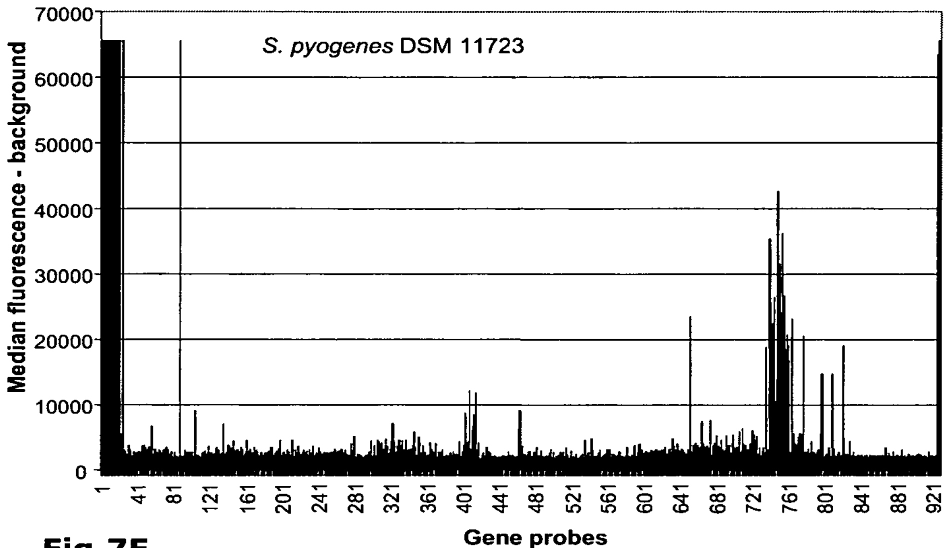
S. pyogenes DSM 11723
Median fluorescence - background
70000
60000
50000
40000
30000
20000
10000
0
1
41
81
121
161
201
241
281
321
361
401
441
481
521
561
601
641
681
721
761
801
841
881
921
Gene probes

Fig.7E

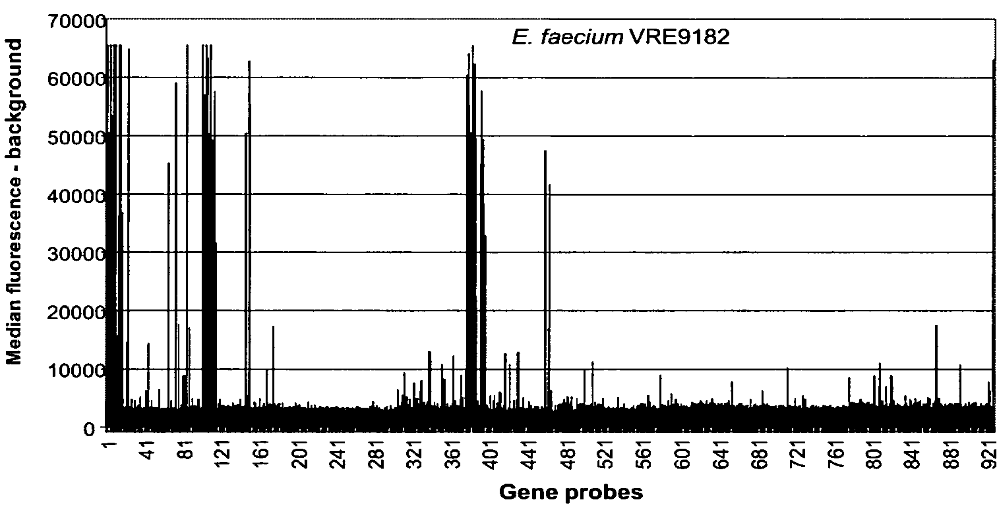
E. faecium VRE9182
Median fluorescence - background
70000
60000
50000
40000
30000
20000
10000
0
1
41
81
121
161
201
241
281
321
361
401
441
481
521
561
601
641
681
721
761
801
841
881
921
Gene probes

Fig.7F

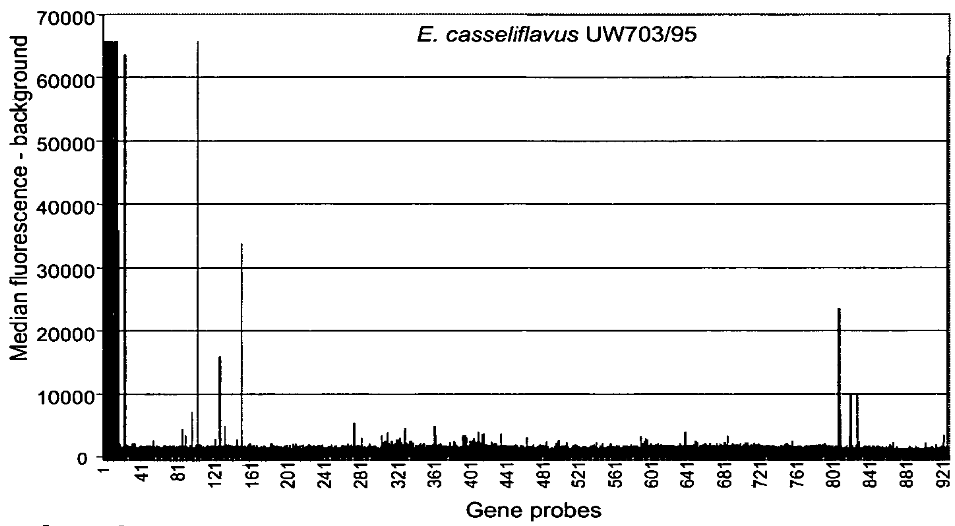
E. casseliflavus UW703/95
Median fluorescence - background
70000
60000
50000
40000
30000
20000
10000
0
1 41 81 121 161 201 241 281 321 361 401 441 481 521 561 601 641 681 721 761 801 841 881 921
Gene probes

Fig.7G

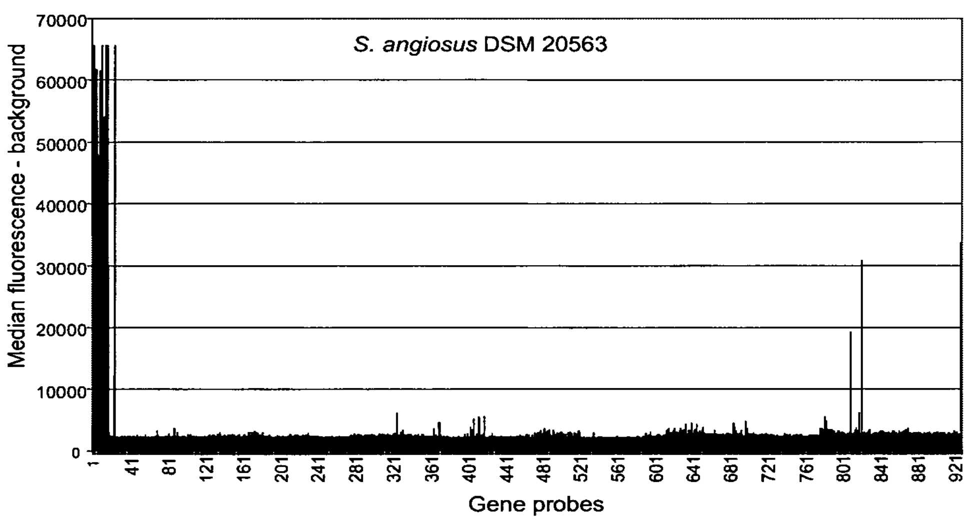
S. angiosus DSM 20563
Median fluorescence - background
70000
60000
50000
40000
30000
20000
10000
0
1 41 81 121 161 201 241 281 321 361 401 441 481 521 561 601 641 681 721 761 801 841 881 921
Gene probes

Fig.7H

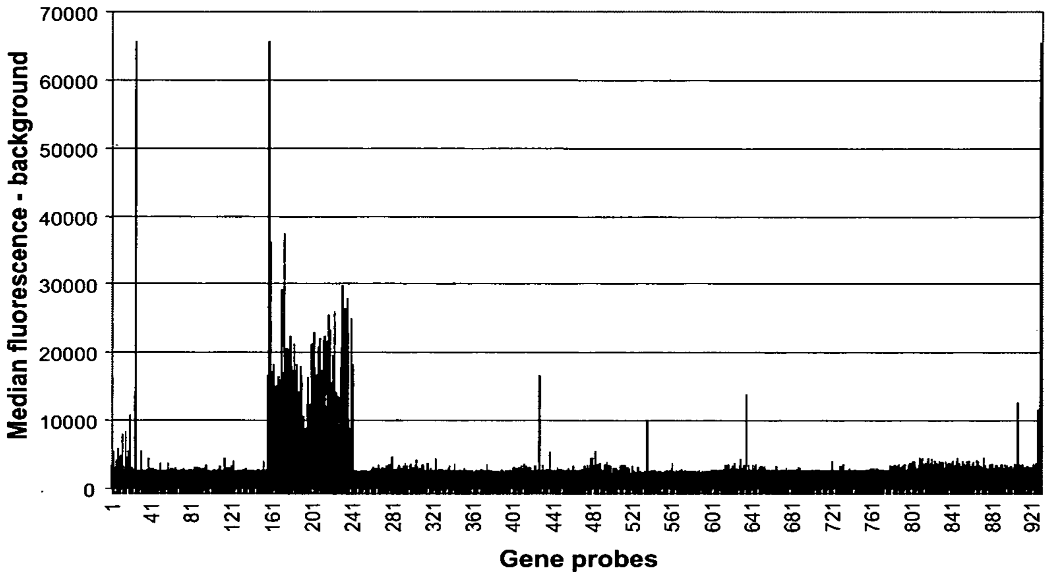
70000
60000
50000
40000
30000
20000
10000
0
Median fluorescence - background
1
41
81
121
161
201
241
281
321
361
401
441
481
521
561
601
641
681
721
761
801
841
881
921
Gene probes

Fig.8A

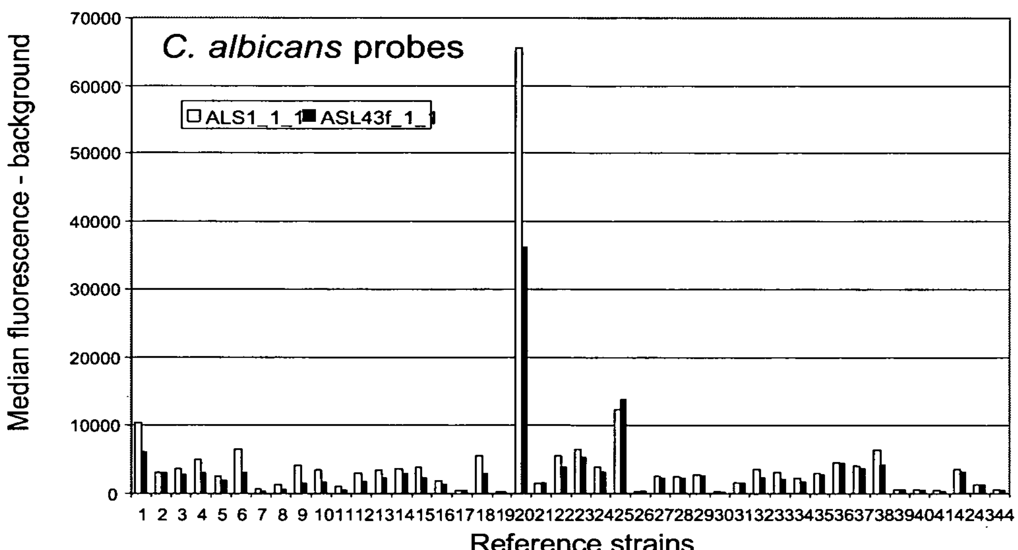
C. albicans probes
ALS1_1_1
ASL43f_1_1
70000
60000
50000
40000
30000
20000
10000
0
Median fluorescence - background
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44
Reference strains

Fig.8B

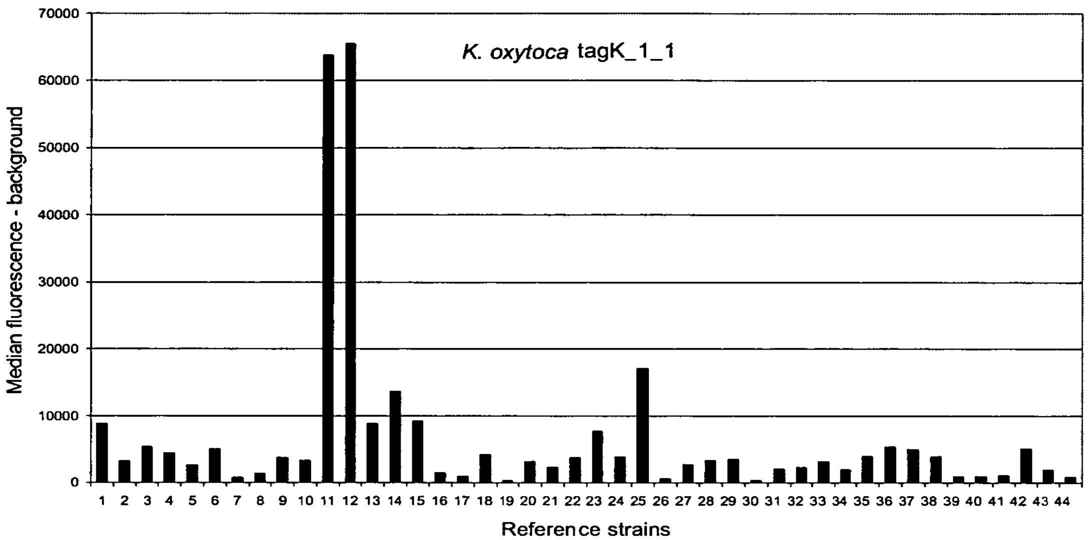
K. oxytoca tagK_1_1
Median fluorescence - background
70000
60000
50000
40000
30000
20000
10000
0
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44
Reference strains

Fig.9A

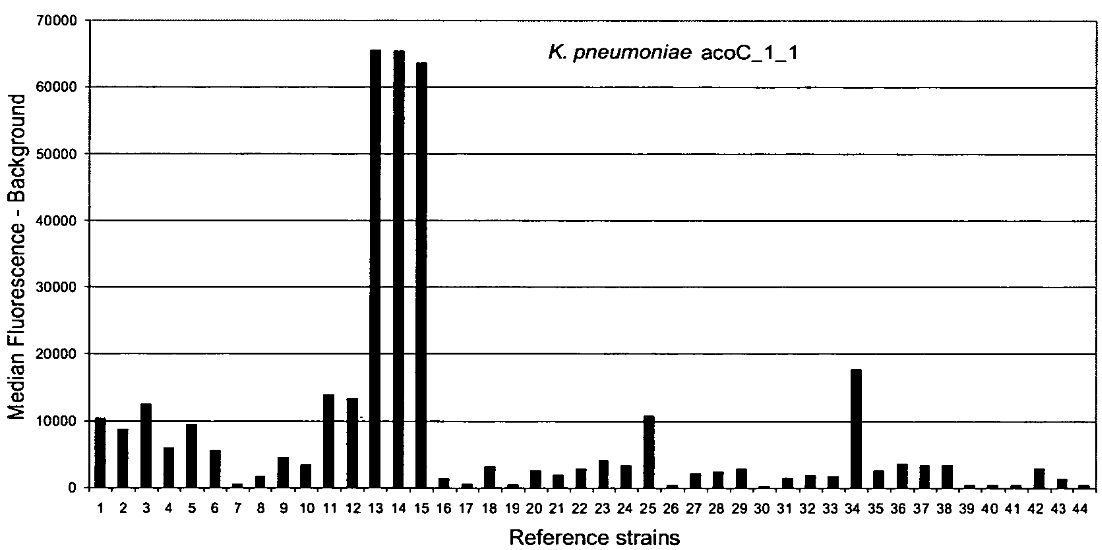
K. pneumoniae acoC_1_1
Median Fluorescence - Background
70000
60000
50000
40000
30000
20000
10000
0
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44
Reference strains

Fig.9B

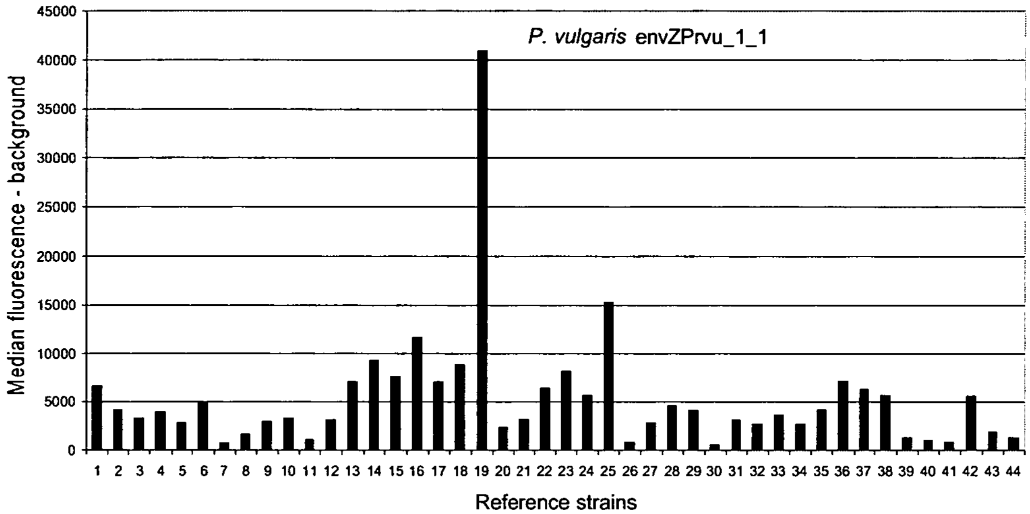
P. vulgaris envZPrvu_1_1
Median fluorescence - background
45000
40000
35000
30000
25000
20000
15000
10000
5000
0
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44
Reference strains

Fig.9C

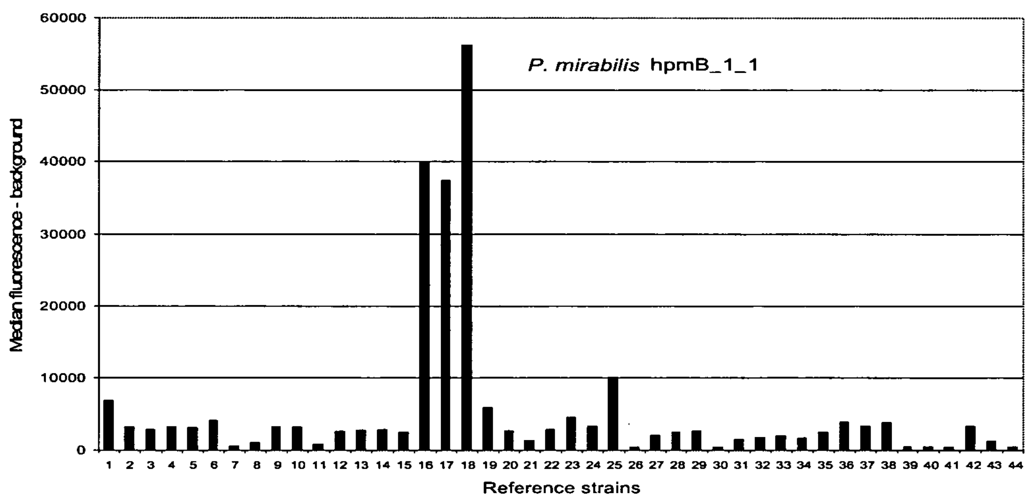
P. mirabilis hpmB_1_1
Median fluorescence - background
60000
50000
40000
30000
20000
10000
0
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44
Reference strains

Fig.9D

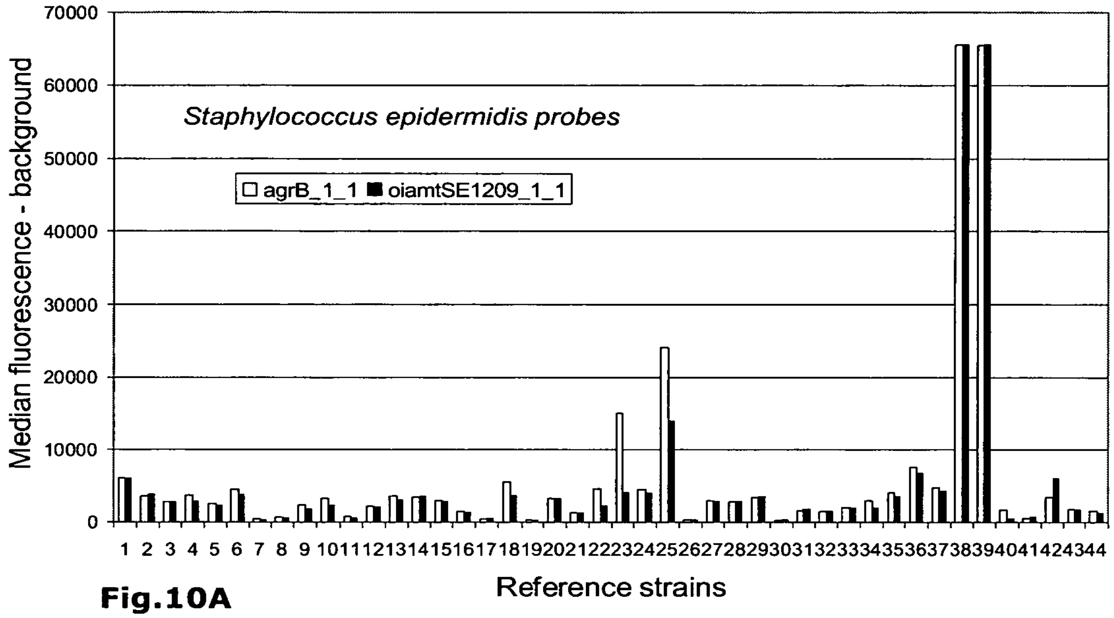

Fig.10A

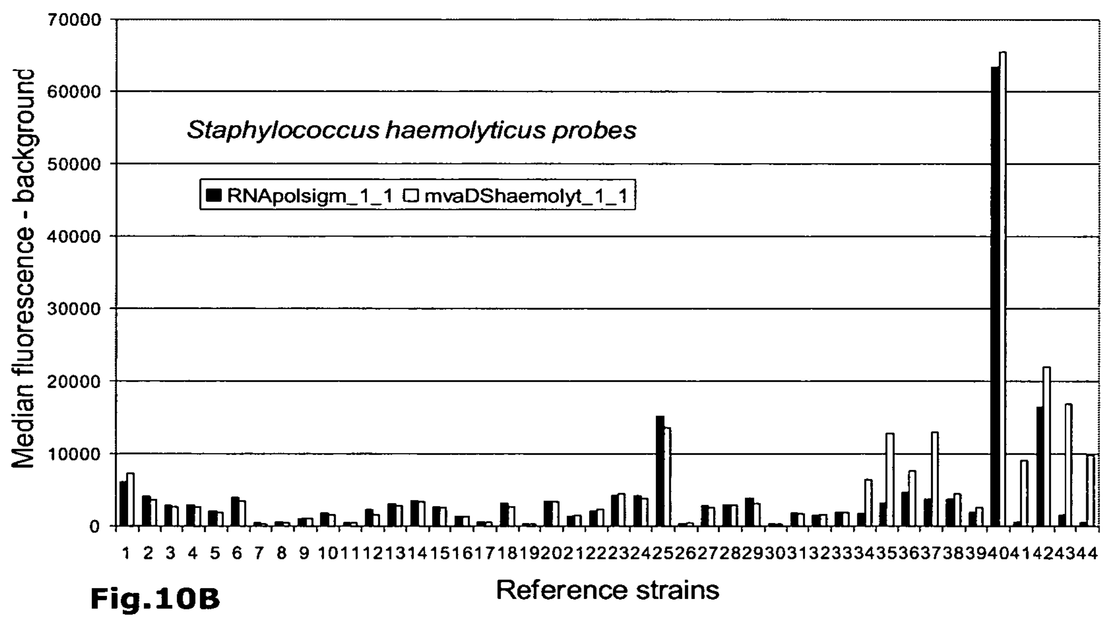

Fig.10B

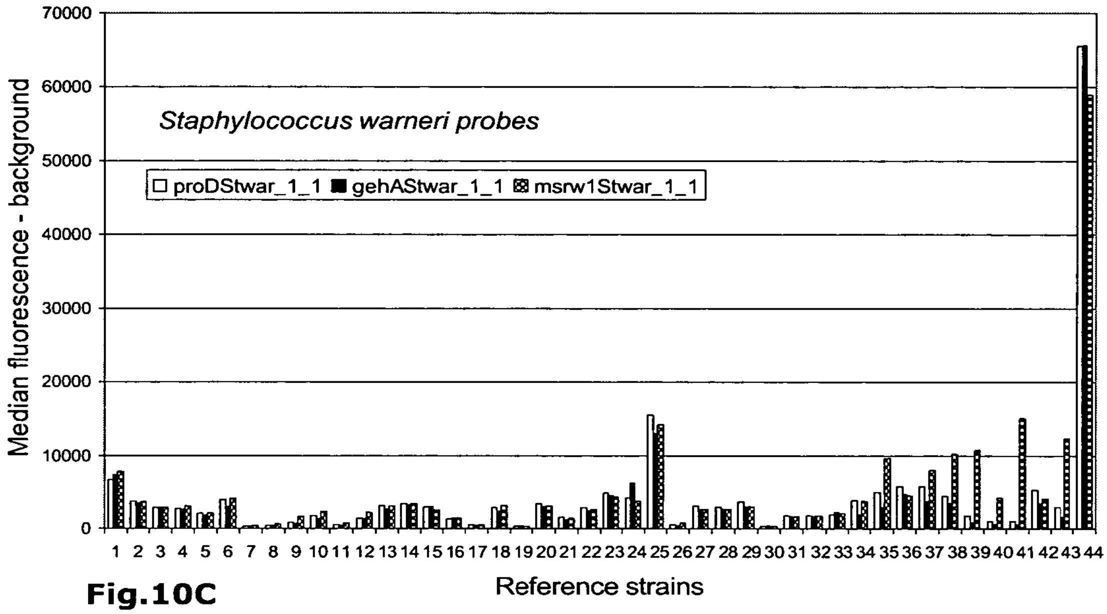

Fig.10C

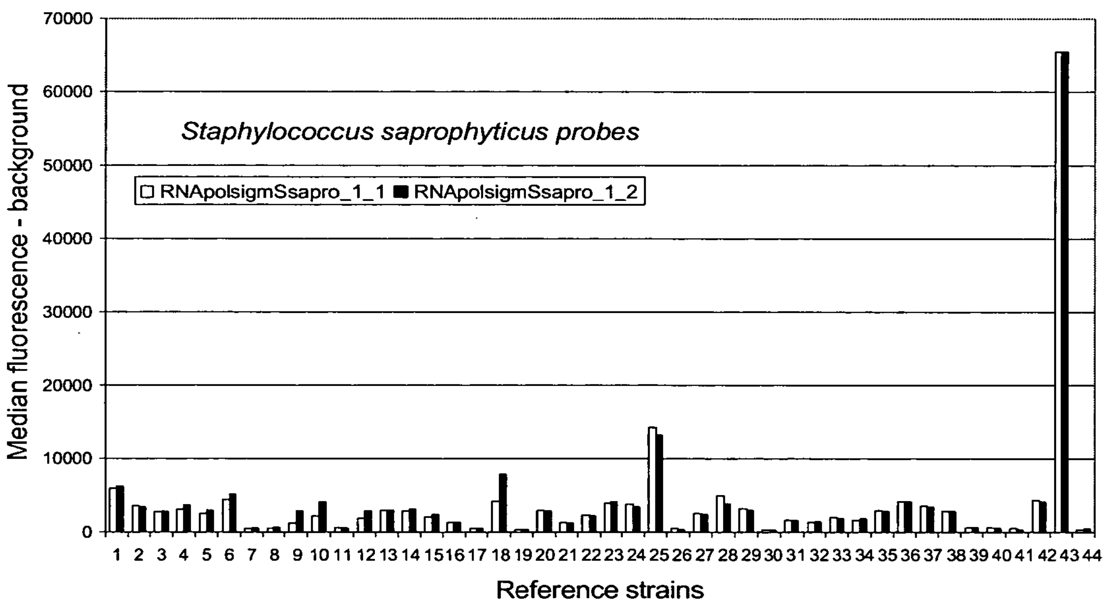

Fig.10D

SEQUENCE LISTING

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<130> 062148wo/JH/PCH

<150> EP 05109025.6
<151> 2005-09-29

<160> 3042

<170> PatentIn version 3.3

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ccactaaaag cgttaatatt tgattctgag tatgatccat atagaggggt aatttcatcg 240

ataagaattg tagacggtgt tgttaaagcc ggagataaaa ttcgaatgat ggcgactggt 300

aaagagttcg aagtaacaga agttggaatt aatacaccta agcagcttcc agttgatgaa 360

ttaacagttg gtgatgttgg ttatattatt gcaagtatta aaaatgttga tgattctagg 420

gttggtgaca ccatcacatt agctagtaga cctgcatcag aaccattgca aggttataag 480

aaaatgaatc caatggtata ttgcggactg ttcccaatag ataacaaaaa ttataatgat 540

ttaagagaag cattagaaaa attacaattg aatgatgcat cattagaatt tgagcctgaa 600

tcgtcacaag cattaggttt tggttatag 629

<210> 29
<211> 265
<212> DNA
<213> Staphylococcus aureus

<400> 29
aaagacgcat caaaaccagc acactttttt caccaagtca ttgtaattgc tttagtactc 60

tttgtatcga aaataattga atcatttatg ccaattccta tgcctggatc agtaatcggt 120

ttagtattat tatttgtatt attatgtact ggtgctgtta agttaggcga agtcgaaaaa 180

gtaggaacga cactaacaaa taacattggc ttactcttcg taccagccgg tatctcagtt 240

gttaactctt taggtgtcat tagcc 265

<210> 30
<211> 278
<212> DNA
<213> Staphylococcus aureus

<400> 30
gattaaccac ttagcactaa atacacctta cttcggaata ctgttatccg ttataccatt 60

tttcttagcg accatattat ttgaaaaaac taatcgtttc ttcttattcg caccgctatt 120

tgtcagtatg gtatttggtg tggccttcct ctatttaaca ggcattccgt ataagactta 180

caaaataggt ggagacatta tttacttctt cttagaaccg gcaacaatct gttttgcgat 240

tccgttatat aaaaagcgtg aagtgcttgt taaacatt 278

<210> 31
<211> 388
<212> DNA
<213> Staphylococcus aureus

<400> 31
cgacaaacac ccaacaagca catacacaaa tgtcaacaca atcacaagac gtatcttatg 60

gtacttatta tacaattgat tctaatgggg attatcatca cacacctgat ggtaactgga 120

atcaagcaat gtttgataat aaagaatata gctatacatt cgtagatgct caaggacata 180

cgcattattt ttataactgt tatccaaaaa atgcaaatgc caatggaagc ggccaaacat 240

atgtgaatcc agcaatagca ggagataaca atgactacac agcgagtcaa agccaacagc 300

atattaatca atatggttat caatcaaatg taggtccaga cgcgagctat tattcacata 360

gtaacaacaa ccaagcgtat aacagcca 388

<210> 32
<211> 203
<212> DNA
<213> Staphylococcus aureus

<400> 32
gttatcgtat taactggtga aggtgattta gcattctgtt ctggtggtga ccagaagaaa 60

cgtggacatg gtggttatgt aggtgaagac caaatccctc gcttaaatgt attagattta 120

cagcgtttaa ttcgtattat tccaaaaccg gttatcgcga tggtaaaagg ttatgctgta 180

ggtggcggta atgtactaaa tgt 203

<210> 33
<211> 1434
<212> DNA
<213> Staphylococcus aureus

<400> 33
cgtaagggaa gtagttatca gtccgggatc acgctcaacg ccacttgcac ttgcatttga 60

agcacatcca aatattaaaa catggataca ccccgatgag cgaagtgcag catttttgc 120

agttgggtta attaaaggta gtgaaagacc tgtcgctata ttatgtacgt caggtacagc 180

agcagcgaat tatacgcctg caattgctga aagccaaatt agtagaattc cattaatcgt 240

tttaacaagt gaccgtccgc atgaattaag aagtgtaggc gcaccacaag cgattaatca 300

agtaaatatg tttaataatt atgtaagtta tgagttcgat atgcctattg cggatgatag 360

taaagagacc attaatgcaa tttattatca aatgcaaatt gctagtcaat atttatatgg 420

accacataaa gggccaattc attttaactt gccatttaga gatccgttaa cacctgattt 480

gaatgcaaca gaattgttaa cttctgagat gaagatttta ccgcactatc aaaaaagtat 540

agatgcatcg gcattaagac acattttaaa taagaaaaaa ggtttaatta ttgtagggga 600

tatgcagcac caagaagttg atcaaatact aacgtattca acgatatatg atttgcctat 660

tttagctgat cctttaagtc atttaagaaa atttgatcat ccgaatgtta tctgtacata 720

tgatttgctg tttagaagcg gcttagactt aaatgtggat ttcgtaattc gtgttgggaa 780

accagtgatt tctaaaaagt tgaatcaatg gttaaagaaa actgatgcat ttcaaatatt 840

agtgcaaaac aatgataaga ttgatgtctt tccgatagca ccagatattt catatgagat 900

ttctgcgaat gatttcttta ggtcattaat ggaagacacg accatcaatc gcgtaagttg 960

gttagaaaaa tggcaacgct tagagaaaaa agggcgtaaa gaaattaaat gttatttgga 1020

acaagctaca gatgagagtg cattcgttgg tgaattgatt aagaaaacat ctgaaaaaga 1080

tgcattattt attagtaata gtatgcctat cagagatgta gataacttgt tattgaataa 1140

aaatatagat gtctatgcga atcgtggtgc gaatggtatt gatggtatcg tttcaactgc 1200

actgggtatg gctgtgcata aacgaataac attattgata ggtgatttat cattttatca 1260

tgatatgaat ggactattaa tgtcaaaatt aaataatatt cagatgaata ttgtattatt 1320

gaacaacgat ggtggcggta ttttttcata tttaccacaa aaagaaagtg caactgacta 1380

ttttgaacgg ttgtttggca caccgacggg attggatttc gagtatacag ctaa 1434

<210> 34
<211> 1149
<212> DNA
<213> Staphylococcus aureus

<400> 34
atggactttt ggttatataa acaagcacaa caaaatggac atcatattgc gataacagac 60

ggtcaagaat cttatactta tcaaaattta tactgtgaag cgagtctatt ggctaaaaga 120

ctcaaggctt atcaacaatc tcgtgtcggg ctatacatag ataattcgat tcaatcgatc 180

attttaatac atgcttgttg gttggcaaat attgaaattg cgatgattaa tacaaggttg 240

acacctaatg agatgaagaa tcagatgagg tcaatcgatg tacaattgat tttttgtacc 300

ttgccactgg aattgcgagg gtttcaaatt gtatcgctgg atgatattga attcgctgga 360

acggatatta caatgaacgg tttgttggac aacacaatgg atatccaata tgatacatcg 420

aatgaaactg tggtgccgaa agagtcgccg tccaacatat taaatacttc atttaattta 480

gatgacattg catcgattat gtttacatca gggacaactg gccctcaaaa agcggtgccg 540

caaacgtttc gtaatcatta tgccagtgca atcggatgta aagagagctt gggatttgat 600

cgtgatacta attggctatc tgtcttgccg atttatcata tttcgggtct cagtgtactt 660

ttaagagctg ttattgaagg gtttactgtg cgcattgttg ataaattcaa tgccgaacaa 720

attttaacga taattaaaaa tgaacgcatc acgcacattt cgcttgtgcc acaaacttta 780

aattggctta tgcaacaagg tttacatgaa ccttataatt tgcaaaaaat attactcggc 840

ggtgctaaat tatctgccac tttgatagag acggcattac aatataacct gccaatttat 900

aattcatttg gtatgactga gacatgttca caatttttaa cagcaacacc ggaaatgttg 960

catgcacgtc ctgacactgt agggatgcca agtgccaatg tagacgttaa aattaaaaat 1020

cctaataaag aaggtcatgg agaattaatg attaaaggtg ccaatgtgat gaatggatat 1080

ttgtatccaa cagatttaac gggtacgttt gaaaatggtt attttaatac gggtgacatt 1140

gctgaaata 1149

<210> 35
<211> 236
<212> DNA
<213> Staphylococcus aureus

<400> 35
attgataatt tacatccaac acctgcttta ggtggctatc caaaagaatt tgcgatggat 60

tttattgaac agaaagaatt tggtacacga ggattatatg gtgcgccggt tggctatata 120

gatatatatg atgattgtga atttattgtt gcaattcgtt cgatgcttat taagaaagca 180

caagcaactt tatttgctgg gtgtggcatt gttaaagatt ctgatccaga tagtga 236

<210> 36
<211> 327

<212> DNA
<213> Staphylococcus aureus

<400> 36
atgaggtact ctttaattag tggtatcttg ataggtttta ttgcgcctct aatcggtgct 60

tttatcgttg ttagacgact atcacttata gctgatgctc taagtcatgt aactttaggt 120

ggtatatctt tcggtatgtt tttacttact attatgccaa cactagtatt tattaatcca 180

atgtggtttg gaatcttatt cgcaatagta ggtgcgcttc taattgaaaa attaagaacg 240

tcatacactg cttaccaaga aattgctatt ccaattataa tgagtgctgg tatcgccttg 300

agtgcaatct tcatttcatt agctgat 327

<210> 37
<211> 195
<212> DNA
<213> Staphylococcus aureus

<400> 37
gaaaatacag aacttgatgg tgaaatgaag tttagaatcg cttgtacaaa ccatcatcat 60

catcatttta tctgtgaaaa gtgtggagat acaaaggtaa tagattattg tccaatagat 120

cagataaagt tatcactacc tggtgttaat attcacaaac acaaacttga agtttatggt 180

gtatgtgagt cttgc 195

<210> 38
<211> 313
<212> DNA
<213> Staphylococcus aureus

<400> 38
acacagagaa taatcaagag aagacgtttt catctgaaga aagtaacagt aagccattta 60

tggtagaaaa tcaaaacgat gaaatagtta taagagaaga ttcatataat ccattcgtaa 120

cgaaaacgtc tgaaagttta atagctgatg atgaatcttc cggttataat aatacacgtg 180

aaaaagatga agactacttc aaaaagcaac aagaaattct acaagaaatg gatcaaacat 240

ttgattcgaa tgacgataca tctgtgcaaa attatgagaa taaagcgtct gatgattatt 300

atgatgtaaa cga 313

<210> 39
<211> 322
<212> DNA
<213> Staphylococcus aureus

<400> 39
ttgtaattca cttaacttca ccaatgcctc aattggtgtc atattagata aattcaaatt 60

tttaatttgt agttcaatct cgctttcttg atcattttca aacaaatcaa atgatgcttg 120

ttcaaagtct ttttgagata aagtatcagt tgtttcttca acacttaagt ttaaattttc 180

ttgattaatt tcaggttcat tttcgaccat ttttaaattt gatatcgatg attttttacc 240

agcagacgct tcaaactcgc ttagaatcac ttgtgctctg ctaataactt tttcaggtaa 300

atcagctaat ttcgcaactt ga 322

<210> 40
<211> 432
<212> DNA
<213> Staphylococcus aureus

<400> 40
actcaaacag ttagcaagat tgctcaagtt aaaccaaaca acactggtat tcgtgcttct 60

gtttatgaaa aaacagcgaa aaacggtgcg aaatatgcag accgtacgtt ctatgtaaca 120

aaagagcgtg ctcatggtaa tgaaacgtat gtattattaa acaatacaag ccataacatc 180

ccattaggtt ggttcaatgt aaaagactta aatgttcaaa acttaggcaa agaagttaaa 240

acgactcaaa aatatactgt taataaatca aataacggct tatcaatggt tccttggggt 300

actaaaaacc aagtcatttt aacaggcaat aacattgctc aaggtacatt taatgcaacg 360

aaacaagtat ctgtaggcaa agatgtttat ttatacggta ctattaataa ccgcactggt 420

tgggtaaatg ca 432

<210> 41
<211> 353
<212> DNA
<213> Staphylococcus aureus

<400> 41
ggtgttccaa actcaaaaga tgatataggt actggtgcat acattcacga tggtgttatt 60

caacaggcaa cacgtattgc taaaaaaatg tatgatgact tattaattgt tgcagacact 120

tgtttatgtg aatatactga tcatggtcat tgtggcgtga ttgatgacca tacacatgac 180

gttgacaatg ataaatcatt gccactgctt gttaaaacag caatttctca agtggaagct 240

ggtgctgata ttattgcgcc aagtaatatg atggatggtt ttgttgctga aattcgtcgt 300

ggattagatg aagccggcta ttacaatatt cctataatga gttatggtgt caa 353

<210> 42
<211> 399
<212> DNA
<213> Staphylococcus aureus

<400> 42
aacacaatcg gaaatgttgg atacggctga aaagttatca aagctaatca agatggatac 60

taagaaaatt acagaacgtg ataagaaaga tttctggatt cagttgcatc ctaaaaaagc 120

aaaagcaatg atgacaaaag aacaagctat gttagcagat ggaagtatta aacaagatca 180

atatgataaa caactgttat cgaaaatcag aaaatcacaa ttagatgaat tgtcttctaa 240

agatttacaa gttttagcta tttttcgaga gatgaatgca ggaacagttt tagatccaca 300

aatgataaaa aatgaagatg tcagtgaaaa agagtatgca gcagtttctc agcaactttc 360

caaattacca ggtgttaaca cgtctatgga ttgggatag 399

<210> 43
<211> 329
<212> DNA
<213> Staphylococcus aureus

<220>
<221> misc_feature
<222> (56)..(56)
<223> n is a, c, g, or t

<220>
<221> misc_feature
<222> (71)..(71)
<223> n is a, c, g, or t

<400> 43
tgacatttca aatcaatcac atcggtgcaa atggttcaag aaatcaaatg aaagcncgca 60

gaagaacttg naaaaagatg gttattctgt tgaagtaatt gacttacgta ctgttcaacc 120

aatcgatgtt gatacaattg tagcttcagt tgaaaaaact ggtcgtgcag ttgtagttca 180

agaagcacaa cgtcaagctg gtgttggtgc agcagttgta gctgaattaa gtgaacgtgc 240

aatcctttca ttagaagcac ctattggaag agttgcagca gcagatacaa tttatccatt 300

cactcaagct gaaaatgttt ggttaccaa 329

<210> 44
<211> 303
<212> DNA
<213> Staphylococcus aureus

<400> 44
ctggagatac tattgaagaa gacgatgttt tagctgaggt acaaaacgat aaatcagtag 60

tagaaatccc atcaccagta tctggtactg tagaagaagt tatggtagaa gaaggtacag 120

tagctgtagt tggtgacgtt attgttaaaa tcgatgcacc tgatgcagaa gatatgcaat 180

ttaaaggtca tgatgatgat tcatcatcta aagaagaacc tgcgaaagag gaagcgccag 240

cagagcaagc acctgtagct actcaaactg aagaagtaga tgaaaacaga actgtaaaag 300

caa 303

<210> 45
<211> 302
<212> DNA
<213> Staphylococcus aureus

<400> 45
tagttatcga gattatcaaa gattggtaga taaacttcaa gttcacgata aagagataga 60

cttagcttct agcttacaac aaacaatgct taaaacagat attccacaat ttgatagtat 120

tcaaattggc gttatttcag tggcggcaca aaaagtaagt ggagattatt ttaatttaat 180

tgaccataac gatggcacaa tgagctttgc tgttgcagat gtcattggaa aaggtatacc 240

agctgcttta gcaatgagta tgataaagtt tggcatggat tcttatggac actcacaatt 300

ac 302

<210> 46
<211> 254
<212> DNA
<213> Staphylococcus aureus

<400> 46
tgaatcttaa tatagaaaca accactcaag ataaatttta cgaagttaaa gtcggtggag 60

aattagatgt ttatactgtg cctgaattag aagaggtttt aacacctatg agacaagatg 120

gaactcgtga tatttatgtt aatttagaaa atgtgagtta tatggattcg acaggtttag 180

gtttattcgt aggtacatta aaagcattaa accaaaatga taaagaacta tacattttag 240

gtgtgtcaga tcgt 254

<210> 47
<211> 191
<212> DNA
<213> Staphylococcus aureus

<400> 47

tctaaagaag attttatcga aatgcgcgtg ccagcatcgg cagagtatgt aagtttaatt 60

cgtttaacac tttctggcgt tttttcgaga gctggtgcta catatgatga tattgaagat 120

gccaagattg cagttagtga agctgtgaca aatgcagtta aacatgcata caaagaaaat 180

aacaatgtag g 191

<210> 48
<211> 204
<212> DNA
<213> Staphylococcus aureus

<400> 48
tgagatagat gcaatcatgt ttatggttaa tgccaatgag gaaattggac gaggtgatga 60

atatattata gaaatgttga aaaatgttaa gacaccagta tttttagtat taaataaaat 120

agatttagtg catccagatg aattaatgcc aaagattgaa gaatatcaaa gttatatgga 180

ctttacagag attgtaccta tttc 204

<210> 49
<211> 234
<212> DNA
<213> Staphylococcus aureus

<400> 49
aatataattg ggaagaagta catcaagaag cagaaatttt agaacatcga atttcagatt 60

tatttgttga aaggctggat agcctgttaa atttcccaga aacttgcccg cacggcggtg 120

tgattcctag aaataatgaa tataaagaga aatatataac aacgattttg aattatgaac 180

ctggtgatat cgttacaatc aaacgtgtga gagataagac cgatttgcta atat 234

<210> 50
<211> 251
<212> DNA
<213> Staphylococcus aureus

<400> 50
ttgaattacc aaaattacca tacgcatttg atgcattaga accacatttt gacaaagaaa 60

ctatggaaat tcatcatgac agacatcata acacttatgt tacgaaatta aatgctgcag 120

tagaaggtac agatttagaa tctaaatcta ttgaagaaat tgttgctaat ttagacagtg 180

taccagctaa catccaaact gctgtacgta ataatggcgg tggacattta aaccattcat 240

tattctggga g 251

<210> 51
<211> 359
<212> DNA
<213> Staphylococcus aureus

<400> 51
gcgcattttg aaaaggcata cttgagaata ctaaagtgct tgttacaatt aaagaaccta 60

ctgttgctaa ttttttcatt gtcttgtccc cttatattac aatttgatta catttacatt 120

atcatacgat tacaaaagaa atgcaacaaa atttttgaat cattacattt ttttataaaa 180

atttcacttt agattcacaa taattactta ttttgtcaat ttatttaatg tcaatatgtt 240

gattaattaa tagtgttgtc taatgtatat aatatttagg tcatcgttat agtcaacaat 300

aataaggtat ttcgagttga aatttatctt attatttttc cacttttacg tgctatccc 359

<210> 52
<211> 438
<212> DNA
<213> Staphylococcus aureus

<400> 52
ttcgttgttc ataggtgcga gtgaactatc aattaaagat ttactacatt taactgagtc 60

acagcggaat attttattct caagccgaat accaaggacg atgagtattt taattgctgg 120

aagttcgttg gctttagcag gcttgataat gcaacaaatg atgcaaaata agtttgttag 180

tccgactaca gctggaacga tggaatgggc taaactaggt attttaattg ctttattgtt 240

ctttccaacc ggtcatattt tattaaaact agtatttgct gttatttgta gtatttgcgg 300

tacgttttta tttgttaaaa tcattgattt tataaaagtg aaagatgtca tttttgtacc 360

gcttctagga attatgatgg gtgggattgt tgcaagtttc acaaccttca tctcattgcg 420

cacgagtgct gttcaaag 438

<210> 53
<211> 288
<212> DNA
<213> Staphylococcus aureus

<400> 53
tattgcctta tttagatgta ttgcttttag gtcgtgctga agcaattaat ctggggatat 60

cgtatgaaaa attaacgcga attctacttg taatagtctc agttttagtt tctgtgtcaa 120

ctgcattagt aggaccaatt acatttttag gtttattaac tgtaaatcta gcgcatgaac 180

taatgaagac gtatgaacat aagtatattt taattgcgac aatttgcttg agttggatta 240 gtttatttag tgcgcaatgg gtagttgaaa atgtgtttga agctacga 288

<210> 54
<211> 431
<212> DNA
<213> Staphylococcus aureus

<400> 54
aatcaaatga tattggaaga tattagcata gatatcgaaa aaggtaaatt gacttcttta 60

attggaccta atggtgcggg taagagtact ttactttcag cgatttgtag gttaattcgt 120

tttgataacg gtgaagtgaa aatagatgga cggctcatgt ctgattataa aaataatgac 180

ttgtcgaaaa aaatatctat attaaaacaa acaaaccata ctgaaatgaa tattacggta 240

gagcagttgg taaactgtgg acgattccct tattctaaag gtcgtttgac gaaagaggat 300

catgatattg tcaatgatgc gctagatttg ttgcaactac aagatatcag aaatcgtaat 360

attaagtcat tatctggtgg acaacgtcag cgtgcatata ttgcaatgac aatagcacaa 420

gatactgaat a 431

<210> 55
<211> 437
<212> DNA
<213> Staphylococcus aureus

<400> 55
catgcggtaa caattctgat aaagaacaat caaaatcaga gactaaaggt tctaaagata 60

cagtgaaaat tgaaaataac tataaaatgc gtggcgagaa aaaagatggt agtgacgcta 120

aaaaagttaa agaaactgtt gaagtaccaa aaaatcctga aaatgcagtt gtgttagact 180

atggcgcatt agatgtaatg aaagaaatgg gcttatcaga caaagtaaaa gcattaccta 240

aaggggaagg cggtaagtca ttaccgaatt tcttagaatc atttaaagat gataaatata 300

caaacgttgg taatttaaaa gaagtgaatt ttgataaaat tgctgcgacg aaacccgaag 360

taatctttat ctctggacgt acagctaatc aaaagaattt agatgaattc aaaaaagctg 420

cacctaaagc gaaaatt 437

<210> 56
<211> 163
<212> DNA
<213> Staphylococcus aureus

<400> 56
gctgactatg aaggtaaagc tgacatttta aaattagatg ttgatgaaaa tccatcaact 60

gcagctaaat atgaagtgat gagtattcca acattaatcg tctttaaaga cggtcaacca 120

gttgataaag ttgttggttt ccaaccaaaa gaaaacttag ctg 163

<210> 57
<211> 471
<212> DNA
<213> Staphylococcus aureus

<400> 57
caattggctt tcgattattg ttgtatctat ttcgatatta ttaattgcaa tagtaatggc 60

atttattttt aaaaaaattg cacgtattaa tacagaaaca gctattttaa gtgttatacc 120

aggagcacta acacaaatgc tggtcatggc tgaacaagac aaacgtgcta atttgttagt 180

tgttagctta acgcaaacat cacgaattat atttgttgtt gttttagtac cgttcatttc 240

atattttttt catgatggta acatgcatgc gaatggaaag ttaacaaaag tcttgccttt 300

atcacaagta ttaaacatag ggcaaatagt tattttagcg atagctatct ttatagttta 360

tctaattatg tctaaaataa agtttccaac atttcaatta ttagcaccac tcattgtatt 420

aattgtttgg aatttttcta caggtttaac atttacacta gatcattggt t 471

<210> 58
<211> 713
<212> DNA
<213> Staphylococcus aureus

<400> 58
cttagatgtc ccatgctgat ataacaattc aatcgcttta tctggatgtt tttcaagatg 60

atatttatca atgattaaag ctagtgctcc cgaaacttta ggtgtggcta atgaagttcc 120

agcttgataa atatatcttc cgttattggc agtagttaaa atgttctcct tatgcatata 180

cccttcattc atccatttat ccacaccgaa ttgatttaaa taagcaaatg atcctccggg 240

cgcagcaata tctgtataat tcataccaaa attggaaaac tcagatagat tactcttttg 300

atctgtagat cctactgtaa cgacattgtc catagatgca ggaacatctt tcacttcgcc 360

attaccttga tattcacgct gtaattttag tttctgtttg tcattgacat caataccatc 420

attaccagct gcagcaacaa cgatagattt tttcttcttg gcgtaattga ttgctttctg 480

taacgcatcg tattctactt tttcatcttt tctaaatgtt tgatggtcat ttttgtccaa 540

aataatataa ctaccaacac taatattaat gacttgattt ccatcatttg cagcttgaac 600

aatcgctttt gatacccaaa gcagttctgt ttttttacta ccaaacacgc gatacattgt 660 aaatttgtta ttcggtgcaa cacctattaa cttaccatta gcactcgttt gac 713

<210> 59
<211> 738
<212> DNA
<213> Staphylococcus aureus

<400> 59
ttcaataggc gtggtgtcag tgttagcggc tacaatgttt gttgtgtcat cacatgaagc 60

acaagcctcg gaaaaaacat caactaatgc agcggcacaa aaagaaacac taaatcaacc 120

gggagaacaa gggaatgcga taacgtcaca tcaaatgcag tcaggaaagc aattagacga 180

tatgcataaa gagaatggta aaagtggaac agtgacagaa ggtaaagata cgcttcaatc 240

atcgaagcat caatcaacac aaaatagtaa aacaatcaga acgcaaaatg ataatcaagt 300

aaagcaagat tctgaacgac aaggttctaa acagtcacac caaaataatg cgactaataa 360

tactgaacgt caaaatgatc aggttcaaaa tacccatcat gctgaacgta atggatcaca 420

atcgacaacg tcacaatcga atgatgttga taaatcacaa ccatccattc cggcacaaaa 480

ggtaataccc aatcatgata aagcagcacc aacttcaact acacccccgt ctaatgataa 540

aactgcacct aaatcaacaa aagcacaaga tgcaaccacg gacaaacatc caaatcaaca 600

agatacacat caacctgcgc atcaaatcat agatgcaaag caagatgata ctgttcgcca 660

aagtgaacag aaaccacaag ttggcgattt aagtaaacat atcgatggtc aaaattcccc 720

agagaaaccg acagataa 738

<210> 60
<211> 780
<212> DNA
<213> Staphylococcus aureus

<400> 60
aggctcgtat gattgaaaaa attgcagagc tcgttcgtga caagaaaatt gacggtatca 60

ctgatttacg tgatgaaaca agtttacgta ctggtgtgcg tgtcgttatt gatgtgcgta 120

aggatgcaaa tgctagtgtc attttaaata acttatacaa acaaacacct cttcaaacat 180

catttggtgt gaatatgatt gcacttgtaa atggtagacc gaagcttatt aatttaaaag 240

aagcgttggt acattattta gagcatcaaa agacagttgt tagaagacgt acgcaatata 300

acttacgtaa agctaaagat cgtgcccata ttttagaagg gttacgtatc gcacttgacc 360

atatcgatga aattatttca acgattcgtg agtcagatac agataaagtt gcaatggaaa 420 gcttgcaaca acgcttcaaa ctttctgaaa aacaagctca agctatttta gacatgcgtt 480

taagacgtct aacaggttta gagagaaaca aaattgaagc tgaatataat gagttattaa 540

attatattag tgaattagaa gccatcttag ctgatgaaga agtgttatta cagttagtta 600

gagatgaatt gactgaaatt agagatcgtt tcggtgatga gcgtcgtaca gaaattcaat 660

taggtggatt tgaagactta gaggacgaag acttaattcc agaagaacaa atagtaatta 720

ctttgagcca taataactac attaaacgtt tgccggtatc tacatatcgt gctcaaaacc 780

<210> 61
<211> 622
<212> DNA
<213> Staphylococcus aureus

<400> 61
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cagagacaac tgtatacaac tatgaaacat tacagcaacg tattagagag cttgctttct 120

taaacaaagg aattcaaatc acattaagag atgaacgtga tgaagaaaac gttagagaag 180

actcctatca ctatgagggc ggtattaaat cttatgttga gttattgaac gaaaataaag 240

aacctattca tgatgagcca atttatattc atcaatctaa agatgatatt gaagtagaaa 300

ttgcgattca atataactca ggatatgcca caaatctttt aacttacgca aataacattc 360

atacgtacga aggtggtacg catgaagacg gatttaaacg tgcattaacg cgtgtcttaa 420

atagttatgg tttaagtagc aagattatga aagaagaaaa agatagactt tctggtgaag 480

atacacgtga aggtatgaca gcaattatat ctatcaaaca tggtgatcct caattcgaag 540

gtcaaacgaa gacaaaatta ggtaattctg aagtgcgtca agttgtagat aaattattct 600

cagagcactt tgaacgattt tt 622

<210> 62
<211> 756
<212> DNA
<213> Staphylococcus aureus

<400> 62
atcatcagcg acaatgagag atatggttag agagaatcat gtaagaaaag aagatttaat 60

atatccaatt tttgtagttg aaaaagacga tgtgaaaaaa gaaattaagt cattgccagg 120

tgtataccaa atcagtttga atttacttga aagtgaatta aaagaagctt atgacttagg 180

catacgtgcc attatgtttt tcggtgttcc aaactcaaaa gatgatatag gtactggtgc 240 atacattcac gatggtgtta ttcaacaggc aacacgtatt gctaaaaaaa tgtatgatga 300

cttattaatt gttgcagaca cttgtttatg tgaatatact gatcatggtc attgtggcgt 360

gattgatgac catacacatg acgttgacaa tgataaatca ttgccactac ttgttaaaac 420

agcaatttct caagtggaag ctggtgctga tattattgcg ccaagtaata tgatggatgg 480

ttttgttgct gaaattcgtc gtggattaga tgaagccggc tattacaata ttcctataat 540

gagttatggt gtcaagtatg catcaagttt ctttggacct tttagagatg cagcagattc 600

agcgccatca tttggggata gaaaaacgta tcagatggac cctgctaacc gtttggaagc 660

acttcgtgaa ttagaaagtg atcttaaaga agggtgcgac atgatgattg ttaaacctgc 720

tctaagttat ttagatatag ttcgagatgt taaaaa 756

<210> 63
<211> 200
<212> DNA
<213> Staphylococcus aureus

<400> 63
gtgccaattg caggatatgc tacaatctca gatcaaaacg aaatcgaatt tacaggttta 60

attatgaccc cagatggtaa agaacgattt gaatatacaa tgaacggaac agatccggtt 120

gagttaggca aaacagtgag taacaaatta aaagagcaag gtgcttatga aattataaaa 180

cgcttaaatg aacaacatta 200

<210> 64
<211> 452
<212> DNA
<213> Staphylococcus aureus

<400> 64
ttgataacat tgctgtgata ggaagtaaga cagcgcaata ttgtgaatca cttggcattc 60

gagttgattt tatgccaaac gacttttctc aagaaggatt tttaaaatca tttaatcaaa 120

ctaaccaaaa aatacttttg ccttcgagtg aattggcgag accattgtta ttagcagcgt 180

tatctaaaga taatgaagtt gttaaaatag atttatatac ttcagtgcct aacaaacaaa 240

atatacaaga tgttaaagaa atgatagaac atcaacaaat cgatgcatta acattttcaa 300

gttcgtcggc agtacgttat tattttaatg aaggatttgt accaaaattc aagtcgtatt 360

ttgctattgg agaacaaaca gcacggacca ttaaatcata tcaacaacca gtaacaattg 420

cagaaattca aacactcgaa tcactaattg aa 452

<210> 65
<211> 757
<212> DNA
<213> Staphylococcus aureus

<400> 65
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tttatagctt tgatataatg attcactgga ttgatattcg tataacgcac accatctaca 120

taaccacttg cacctgctcc aaatccataa tattcctcat taaaccagta aaccttatta 180

tgttctgatt catggccatc taatgcaaaa ttagatattt cgtattgatg gaaaggagat 240

tgttctatct tagacatcaa caactgatac atgtcagcac ctaaatcctc attaggaagt 300

ttaagcaacc cttttctata catattataa aattgggttt taggttcaag tattaagccg 360

taactcgaaa tatgttgaat atccatatct aaagctagat ctaaactttg ttcaaaatct 420

tcaatcgtct gtttcggtaa atgatacatt aaatctaaac tgattgattt aatacctgcg 480

tttttagcat ttaacaccga agtgtaaata tcttcagtat tgtgcgttct acctaaaaca 540

gacaataact ccggtttgaa tgtttgaacg cccattgaaa ttctatttac tccatatttc 600

tctaatagtt ggactttctc tttagttaac tcatcaggat ttgcttcaaa tgtatactcg 660

cctgtgattg taaacgtatc acgtattgct ttaagtaatc tttccaactg attaatagaa 720

agggccgttg gtgtgccgcc acctacatac atggtct 757

<210> 66
<211> 464
<212> DNA
<213> Staphylococcus aureus

<400> 66
agggcaaatg ctttcagtaa ctataaatag tggcattata aaatttagtg aattggatag 60

aaaagataat tcaagtaaag ataaaagtaa ttataaagta gttaggaaaa atgatattgc 120

atataattct atgagaatgt ggcaaggggc tagtggtaaa tcaaattata atgggattgt 180

tagccctgca tatactgtgc tttatccaac acaaaatact agctcattat ttattggata 240

taagtttaaa acacatagaa tgattcataa atttaaaatt aattcacaag gattaacatc 300

agatacatgg aacttaaaat ataaacaatt aaaaaatata aatatagata tacctgtatt 360

ggaggaacaa gaaaagatag gtgatttctt taaaaaaatg gatatattga taagtaaaca 420

gaaaatgaaa attgaaatat tagaaaaaga gaaacaatcc tttt 464

<210> 67
<211> 533
<212> DNA
<213> Staphylococcus aureus

<400> 67
gtgccagagt tgagattccc agggtttgaa ggcgaatggg aagagaagca gttgggggat 60

cttacagata gagtaattag gaaaaataaa aacttagaat cgaaaaagcc tttaacaata 120

tccggacagt taggtttaat tgatcaaaca gaatatttta gtaaatcagt ttcgtcgaaa 180

aatctagaaa attatacact aataaagaat ggagaattcg cgtataacaa aagttattct 240

aatggatacc cattaggggc tattaaaaga ttaactagat atgatagtgg tgtattgtcc 300

tctttgtata tttgtttttc tattaaaagt gaaatgtcta aagacttcat ggaagcatat 360

tttgattcga cacactggta tagagaagtt tctggaattg cagttgaggg tgcaagaaat 420

cacggattat taaatgtttc tgtgaatgat ttttttacta ttctaattaa atatccaagt 480

ttagaagaac agcaaaaaat aggcaagttc ttcagcaaac tcgaccgaca aat 533

<210> 68
<211> 721
<212> DNA
<213> Staphylococcus aureus

<400> 68
tgcatcttcc attttaatag ctacattact atttttaagt ggtggacaag cacaagcagc 60

tgagaagcaa gtgaatatgg gaaattcaca ggaggataca gttacagcac aatctattgg 120

ggatcaacaa actagggaaa atgctaatta tcaacgtgaa aacggtgttg acgaacagca 180

acatactgaa aatttaacta agaacttgca taatgataaa acaatatcag aagaaaatca 240

tcgtaaaaca gatgatttga ataaagatca actaaaggat gataaaaaag catcgcttaa 300

taataaaaat attcaacgtg atacaacaaa aaataacaat gctaatccta gcgatgtaaa 360

tcaagggtta gaacaggcta ttaatgatgg taaacaaagt aaagtggcgt cacagcaaca 420

gtcaaaagag gcagataata gtcaagattc aaacgctaat aacaatctac cttcacaaag 480

tcgaataaag gaagcaccat cattaaataa gttagatcaa acaagtcaac gagaaattgt 540

taatgagaca gaaatagaga aagtacaacc acaacaaaat aatcaagcga atgataaaat 600

tactaactac aattttaaca atgaacaaga agtgaaacct caaaaagacg aaaaaacact 660

atcagtttca gatttaaaaa acaatcaaaa atcaccagta gaaccaacaa aggacaatga 720 c 721

<210> 69
<211> 416
<212> DNA
<213> Staphylococcus aureus

<400> 69
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aaagtcactt taacgcatcg tgattgtttg tttatcgaat tgattgatga caaaggaaat 120

gcatatttcg gggaatgtaa cgcttttcaa acagattggt atgatcatga aacaattgcc 180

tcagtgaaac atgtaattga gcaatggttc gaagataata gaaataaatc atttgaaacg 240

tatgaagcag cactaaaatt agtagattca ttggaaaata cgcctgctgc aagggcaact 300

attgtcatgg cattgtatca aatgtttcat gtactgcctt cattttcagt agcatatgga 360

gcgacagcga gcggcttatc aaataaacaa ctagagtcat taaaagcaac aaagcc 416

<210> 70
<211> 400
<212> DNA
<213> Staphylococcus aureus

<400> 70
gtattattgc ttggggtgat gatgaacatc tacgtaaaat tgaagcagat gttccaattt 60

attattatgg atttaaagat tcggatgaca tttatgctca aaatattcaa attacggata 120

aaggtactgc ttttgatgtg tatgtggatg gtgagtttta tgatcacttc ctgtctccac 180

aatatggtga ccatacagtt ttaaatgcat tagctgtaat tgcgattagt tatttagaga 240

agctagatgt tacaaatatt aaagaagcat tagaaacgtt tggtggtgtt aaacgtcgtt 300

tcaatgaaac tacaattgca aatcaagtta ttgtagatga ttatgcacac catccaagag 360

aaattagtgc tacaattgaa acagcacgaa agaaatatcc 400

<210> 71
<211> 613
<212> DNA
<213> Staphylococcus aureus

<400> 71
tggctatcag taatgtttcg aaagggcaat acgcaaagag gtttttcttt ttcgctacta 60

gttgcttagt gttaacttta gttgtagttt caagtctaag tagctcagca aatgcatcac 120 aaacagataa cggcgtaaat agaagtggtt ctgaagatcc aacagtatat agtgcaactt 180

caactaaaaa attacataaa gaacctgcga ctttaattaa agcgattgat ggtgatacgg 240

ttaaattaat gtacaaaggt caaccaatga cattcagact attattggtt gatacacctg 300

aaacaaagca tcctaaaaaa ggtgtagaga aatatggtcc tgaagcaagt gcatttacga 360

aaaaaatggt agaaaatgca aagaaaattg aagtcgagtt tgacaaaggt caaagaactg 420

ataaatatgg acgtggctta gcgtatattt atgctgatgg aaaaatggta aacgaagctt 480

tagttcgtca aggcttggct aaagttgctt atgtttacaa acctaacaat acacatgaac 540

aacatttaag aaaaagtgaa gcacaagcga aaaaagagaa attaaatatt tggagcgaag 600

acaacgctga ttc 613

<210> 72
<211> 212
<212> DNA
<213> Staphylococcus aureus

<400> 72
atggtcaagc tgctgaagtt gattacattg gtatgccagc agtatgcttt actgaacctg 60

aattagctac agttggttat tcagaagcgc aagctaaaga agaaggttta gcaattaaag 120

cttctaaatt tccatatgca gcaaatggtc gtgcattatc attagacgat actaacggat 180

ttgttaaact tattacactt aaagaagatg at 212

<210> 73
<211> 763
<212> DNA
<213> Staphylococcus aureus

<400> 73
tggaagacat cgtaaacgta gaaactacgc gagaatttca gaagtattag aattaccaaa 60

cttaatagaa attcaaacta aatcttacga gtggttccta agagaaggtt taatcgaaat 120

gtttagagac atttctccaa ttgaagattt tactggtaat ttgtcattag agtttgtgga 180

ttaccgttta ggagaaccaa aatatgattt agaagaatct aaaaaccgtg acgctactta 240

tgctgcacct cttcgtgtaa aagtgcgtct aatcattaaa gaaacaggag aagttaaaga 300

acaagaagtc tttatgggtg atttcccatt aatgactgat acaggtacgt tcgttatcaa 360

tggtgcagaa cgtgtaatcg tatctcaatt agttcgttca ccatccgttt atttcaatga 420

aaaaatcgac aaaaatggtc gtgaaaacta tgatgcaaca attattccaa accgtggtgc 480 atggttagaa tatgaaacag atgctaaaga tgttgtatac gtacgtattg atagaacacg 540

taaactacca ttaacagtat tgttacgtgc attaggtttc tcaagcgacc aagaaattgt 600

tgacctttta ggtgacaatg aatatttacg taatacttta gagaaagacg gcactgaaaa 660

cactgaacaa gcgttattag aaatctatga acgtttacgt ccaggtgaac caccaactgt 720

tgaaaatgct aaaagtctat tgtattcacg tttctttgat cca 763

<210> 74
<211> 500
<212> DNA
<213> Staphylococcus aureus

<400> 74
ggcagttgta ctcccacatg gtgtcttatt ccgtggtgcc gcagaaggcg tcattcgtcg 60

ttatttaatt gaagaaaaga actacttaga agccgtgatt ggcttaccag tgaatatttt 120

ctatgggaca agtattccaa catgtatctt agtatttaaa aaatgttgcc aacaagacga 180

caacgtatta tttatcgatg catccaatga ttttgaaaaa ggaaaaaatc aaaaccattt 240

aagcgatgcc caagtcgaac gtattattga cacatacaag cgtaaagaaa caattgataa 300

atacagttac agtgcgacat tacaagagat tgccgataac gattacaacc taaacatacc 360

gaggtatgtc gatacattcg aagaagaagc gccaattgat ttagatcaag tccaacaaga 420

tttgaaaaat atcgacaaag aaatcgcaga aattgaacaa gaaatcaatg catacctgaa 480

agaacttggg gtgttgaaag 500

<210> 75
<211> 468
<212> DNA
<213> Staphylococcus aureus

<400> 75
tgaatagaaa tactaggacc acaaccggtt atttttcaat agaagaaata gattcaagaa 60

aaagccttga tgaaagagaa acagaaaaaa agtatcctgt gaaaatgata aacaataaaa 120

ttattccaac tgaggagata aaagatgaaa agttgaaaaa ggaaattgaa aactttaagt 180

tttttgtgca atatggcagt tttaaaggaa tagagaatta tgaaaatggt gacatttcct 240

ataattctga agctcctatt tattcagcga aatataaact gaaaaatgat gattataatg 300

ttaaagaatt acgaaaaaga tataatattc caacagaaaa ggcgcctaaa ttgttgttga 360

aaggttcggg ggatttgaaa gggtcttcag ttggatataa ggaaattgaa tttatattta 420 tagaaaataa aaaagaaaat atatattttt cagatggatt aaacttaa 468

<210> 76
<211> 512
<212> DNA
<213> Staphylococcus aureus

<400> 76
ggtgtattag ataatgaagg tatggtttta aatttggata gaaatacacg aacggccaag 60

ggatattatt ttgtagatac tatatatgac aatcatgaaa actcttatag taaaaattat 120

agagttgaga tgaaaaacaa taaaattatt ttattagaca aggtggaaga tcaaaaactt 180

aaagaaagaa tagaaaactt taaatttttc ggacaatatg ccgatttcaa gagtttgaaa 240

agttacaacc atggcgacgt ttcaattaat agtaatgttc caagttatga cgcgaaattt 300

aaaatgagta ataaagatga aaatgttaag caattaagaa gccgttataa cattcctact 360

gataaagctc caatattaaa aatgcatatt gatggggact taaaaggcag ttccgttgga 420

tataaaaagt tagaaataga cttttcaaaa gaagaaaata gcgaattatc aatagtcgat 480

tcattaaatt ttcaacctgc caaaaataaa ga 512

<210> 77
<211> 502
<212> DNA
<213> Staphylococcus aureus

<400> 77
aaccaaaagg cgagagttta aaatcacgag gaatgatatt aaagttagat agaaataaga 60

gaactgctaa aggaagttat attattagag aattgaaaga agataaaaat catgatgttc 120

aaaaaaatga aaagaaatat ccagtgaaat tggtgaataa taggatagtt ttggtaaaag 180

atgttaaaga caaaaagtta aaaaatgaaa tagagtcgtt tgaattattt tcacaatatg 240

gaaactttaa tcattttgat cggaatgaga ttactaatat ttcatataat cctaatgctc 300

ccaattactc tgcagaatat aaaatgaaga aaaatgacag aaacattcaa cagttgaaaa 360

agagatttaa tctaaaaact agcaagacac caaaattatt gtttaaggga tctggagata 420

taaaggggtc ttctgtagga tataaggaaa tagaaatcat atttagtaga agtaaagaag 480

aagcatttat tatgttgaca gc 502

<210> 78
<211> 400
<212> DNA

<213> Staphylococcus aureus

<400> 78
gcgaaagagt cgaaatcagc taatgaaatt tcacctgagc aaattaacca atggattaaa 60

gaacaccaag aaaataagaa tacagatgca caggataagt tagttaaaca ttaccaaaaa 120

ctaattgagt cattggcata taaatattct aaaggacaat cacatcacga agatttagtt 180

caagttggta tggttggttt aataggtgcc ataaatagat tcgatatgtc ctttgaacgg 240

aagtttgaag ccttttagt acctactgta atcggtgaaa tcaaaagata tctacgagat 300

aaaacttgga gtgtacatgt tccgagacgt attaaagaaa ttgggccaag aatcaaaaaa 360

gtgagcgatg aactaaccgc tgaattagag cgttcacctt 400

<210> 79
<211> 529
<212> DNA
<213> Staphylococcus aureus

<400> 79
ccgttacgtt gttcttcagt taagttaggt aaatgtaaaa tttcatagaa agcattttgt 60

tgttctttgt tgaatttgtt gtcagctttt ggtgcttgtg catcatttag ctttttagct 120

tctgctaaaa ggttagcgct ttggcttggg tcatctttta agctttggat gaaaccattg 180

cgttgttctt cgtttaagtt aggtaaatgt aagatttcat agaaagcatt ttgttgttct 240

ttgttgaatt tgttatccgc tttcggtgct tgagattcat ttaacttttt agcttctgac 300

aataggttag cactttgact tgggtcatct tttaagcttt ggatgaaacc attgcgttgt 360

tcttcgttca agttaggcat gttcaagatt tcatagaaag cattttgttg ttctttgttg 420

aaattgttgt cagctttcgg tgcttgagat tcgtttaatt ttttagcttc acctaaaacg 480

ttagtgcttt ggcttggatc gtctttaaga ctttgaatga aaccattgc 529

<210> 80
<211> 528
<212> DNA
<213> Staphylococcus aureus

<400> 80
tgatattgga agatattagc atagatatcg aaaaaggtaa attgacttct ttaattggac 60

ctaatggtgc gggtaagagt actttacttt cagcgatttg taggttaatt cgttttgata 120

acggtgaagt gaaaatagat ggacggctca tgtctgatta taaaaataat gacttgtcga 180

aaaaaatatc tatattaaaa caaacaaacc atactgaaat gaatattacg gtagagcagt 240 tggtaaactg tggacgattc ccttattcta aaggtcgttt gacgaaagag gatcatgata 300

ttgtcaatga tgcgctagat ttgttgcaac tacaagatat cagaaatcgt aatattaagt 360

cattatctgg tggacaacgt cagcgtgcat atattgcaat gacaatagca caagatactg 420

aatatatttt gctagatgaa ccattaaata atttagatat gaagcatgct gttcaaatta 480

tgcaaacgtt aaaaatgtta gcgcataaaa tgaataaagc gattgtca 528

<210> 81
<211> 513
<212> DNA
<213> Staphylococcus aureus

<400> 81
ttttgattta tcttctgacg gtttaaaata accattcttt acccattctt cataacgtcc 60

cgcttcaact tcacgaggat catattttgg tttcatttcc atttgctata cctcctaaaa 120

aaataaaaat atccatccta tatacaaata ggacggatat tccgtggtac cacctatatt 180

caagaaggat gattaatatc aaattcactc ttttaacata attggaataa tcataccaat 240

actatcatcg tgaaatttga aatgcttcat ctcttcaagc actctagatt atgattaacg 300

ctcaaacacg tcttagccta ctattaatca cgttcagcta agatactctg tgggctacct 360

tcagtaagaa aatcatttac atactcacac caaatcatat gctctcttta aaataatttg 420

aacttactct tcccaaatcc tatattaaac tcttaactta tagtataatg attgacaaaa 480

taagtcaatg tataggtggg aataaaatga atg 513

<210> 82
<211> 361
<212> DNA
<213> Staphylococcus aureus

<400> 82
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ttgaaactaa tttttaaagc accgtatata tcttcgcgta cttctaagat tcttaagttg 120

cttatagata tgttatgtaa actcaggata taagtcactt tacttatcat acctgattca 180

tccggaatgt ctacatatag atcatacgca gtatttagtc cacctagttg tttagcgggt 240

agtgcgtcgc gatacgattt agcttgggca aaaaatgata acaatttttc agaatcattg 300

ctttcaatta gtctttctaa atcttgaaac tgacttttta gctgtcgaat catttctaaa 360

a 361

<210> 83
<211> 731
<212> DNA
<213> Staphylococcus aureus

<400> 83
atgagatacc taacatcagg agaatcacat ggacctcaat taacagttat tgttgaaggt 60

gtacctgcaa atttagaagt taaggttgag gatattaata aagaaatgtt taagcgtcaa 120

ggcggttacg gacgtggacg tcgtatgcaa attgaaaaag atacagtgga gattgtttcg 180

ggtgtaagaa atggttatac attaggtagc cctattacaa tggttgttac taatgatgat 240

tttacacatt ggcgaaaaat tatgggccgt gcgccaataa gcgacgaaga acgagaaaat 300

atgaaacgta caattacgaa gccaagaccg ggacatgcag atttacttgg cggtatgaaa 360

tataatcatc gtgacttacg aaatgtatta gaacgttcat ctgccagaga aacagcagca 420

cgtgtagcgg tcggtgcact atgcaaagtt ttattagaac aattagatat cgaaatatac 480

agtcgtgttg ttgagatagg tggcattaaa gataaagatt tttatgattc agaaacattt 540

aaagcaaacc ttgatcgaaa tgacgtccgt gtaattgatg atggcatcgc acaagcaatg 600

cgcgataaaa ttgatgaagc gaaaacagat ggtgattcaa taggggcgt agttcaagtt 660

gtagttgaaa atatgcctgt tggtgtaggt agttatgtac attatgatcg taaattagat 720

ggaagaatag c 731

<210> 84
<211> 254
<212> DNA
<213> Staphylococcus aureus

<400> 84
accttcaata ttcgcatcca taagtttcaa tggtctcaag acacgatcca ttggcctttt 60

accaattgaa acatcgccag acaaaacact ttcaatacct aaaccactta acaaaccagc 120

taacaatcga gtcgttgtgc cagagtttcc agtatataaa acttgatgag gtgttttaaa 180

agctttatat ccaggtgaat tcacaaccaa tttatcttca tcttctttaa tatctacgcc 240

taataatcgg aata 254

<210> 85
<211> 716
<212> DNA
<213> Staphylococcus aureus

<400> 85
tcgaggaatt aacaaaggtc aaaggttata caacacatgt ggataacaat gatatgggca 60

acttgattgt gacgaataaa tatacgccag aaacaacatc aattagtggt gaaaaagtat 120

gggacgacaa agacaatcaa gatggtaaga gaccagaaaa agtcagtgtg aatttattgg 180

ctaacggaga gaaagtaaaa acgttagacg tgacatctga aacaaactgg aagtacgaat 240

ttaaagactt accgaagtat gatgaaggaa agaaaataga atatacagtg accgaagatc 300

acgtaaaaga ctacacaaca gacatcaacg gtacgacaat aacgaacaag tatacaccag 360

gagagacatc ggcaacagta acaaaaaatt gggatgacaa taataaccaa gacggaaaac 420

gaccaactga aatcaaagtt gagttatatc aagatggaaa agcaacagga aaaacggcaa 480

tattaaatga atctaataac tggacacata cgtggacagg attagatgaa aaagcaaaag 540

gacaacaagt aaaatacaca gtcgatgaat taacaaaagt taatggctat acaacgcatg 600

tggataacaa tgatatgggt aacttgattg tgacaaataa atatacgccg aaaaaaccga 660

ataaaccaat ctatcctgaa aaaccaaaag acaaaacacc accaactaaa cctgat 716

<210> 86
<211> 581
<212> DNA
<213> Staphylococcus aureus

<400> 86
gaacctagcc atcaagacag tacacctcaa catgaagagg aatattataa taagaatgct 60

tttgcaatgg ataaatcaca tccagaacca atcgaagaca atgataaaca cgatactatt 120

aaaaatgcag aaaataacac tgagcattca acagtttctg ataagagtga agctgaacaa 180

tctcagcaac ctaaaccata ttttacaaca ggtgctaacc aatcagaaac atcaaaaaat 240

gaacatgata atgattctgt aaaacaagat caagatgaac ctaaagaaca tcataatggt 300

aaaaaagcag cagctattgg tgctggaaca gcaggtgttg caggtgcagc tggtgcaatg 360

gctgcttcta aagctaagaa acattcaaat gacgctcaaa acaaaagtaa ttctggcaag 420

gcgaataact cgactgagga taaagcgtct caagataagt ctaaagatca tcataatggc 480

aaaaaaggtg cagcgatcgg tgctggaaca gcaggtttgg ctggaggcgc agcaagtaaa 540

agtgcttctg ccgcttcaaa accacatgcc tctaataatg c 581

<210> 87
<211> 530

<212> DNA
<213> Staphylococcus aureus

<400> 87
tcgtgcatta gtaccatcag gtgcttcaac tggtgaacac gaagctgttg aattacgtga 60

tggagataaa tcacgttatt taggtaaagg tgttactaaa gcagttgaaa acgttaatga 120

aatcatcgca ccagaaatta ttgaaggtga attttcagta ttagatcaag tatctattga 180

taaaatgatg atcgcattag acggtactcc aaacaaaggt aaattaggtg caaatgctat 240

tttaggtgta tctattgcag tagcacgtgc agcagctgac ttattaggtc aaccacttta 300

caaatattta ggtggattta atggtaagca gttaccagta ccaatgatga acatcgttaa 360

tggtggttct cactcagatg ctccaattgc attccaagaa ttcatgattt tacctgtagg 420

tgctacaacg ttcaaagaat cattacgttg gggtactgaa attttccaca acttaaaatc 480

aattttaagc aaacgtggtt tagaaactgc agtaggtgac gaaggtggtt 530

<210> 88
<211> 560
<212> DNA
<213> Staphylococcus aureus

<400> 88
cgccaaaata gtgcttcaat atcagatagt tattattggg atatcattaa aaatctagaa 60

ttacaattta ctgctgcatt agatttatta gaagattatc gatatggtga aaaagagtat 120

gaaaaagcaa aagatcaact aatgacaagg atattaagtg aagtcaagta tttacttgag 180

caaaaaatta aagaatatga caagtataaa gatttatata aagaatatat gagtaaaaat 240

ccaacgtcaa aggtaaaaag agcaaatttt gatcaatata atatcgaaga cctaagagaa 300

aaagaatata atgatttact aagttctatt aaagatgcgg tagaaacatt taaatcagat 360

gtacaaaaaa tagaatatga aaataaagag ttaaaatctt attcttacga agaagaaaag 420

aaggctgctt ctagagttga tgatttagca aataaagcgt atagcgttta ttttgcgttt 480

gttagggata cacaacataa aactgaggca ttagagttaa aagcgaaagt ggatttagtt 540

ttaggtgatg aggacaaacc 560

<210> 89
<211> 462
<212> DNA
<213> Staphylococcus aureus

<400> 89

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tgaaaaataa attgatagca aaatctttat taacaatagc ggcaattggt attactacaa      60

ctacaattgc gtcaacagca gatgcgagcg aaggatacgg tccaagagaa aagaaaccag     120

tgagtattaa tcacaatatc gtagagtaca atgatggtac ttttaaatat caatctagac     180

caaaatttaa ctcaacacct aaatatatta aattcaaaca tgactataat attttagaat     240

ttaacgatgg tacattcgaa tatggtgcac gtccacaatt taataaacca gcagcgaaaa     300

ctgatgcaac tattaaaaaa gaacaaaaat tgattcaagc tcaaaatctt gtgagagaat     360

ttgaaaaaac acatactgtc agtgcacaca gaaaagcaca aaaggcagtc aacttagttt     420

cgtttgaata caaagtgaag aaaatggtct tacaagagcg aa                        462
```

<210> 90
<211> 584
<212> DNA
<213> Staphylococcus aureus

<400> 90

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aatcctcata acgcagaaag agtaaccttg aaatataaat ggaaatttgg agaaggaatt      60

aaggcgggag attattttga tttcacatta agcgataatg ttgaaactca tggtatctca     120

acactgcgta aagttccgga gataaaaagt acagatggtc aagttatggc gacaggagaa     180

ataattggag aaagaaaagt tagatatacg tttaaagaat atgtacaaga aaagaaagat     240

ttaactgctg aattatcttt aaatctattt attgatccta caacagtgac gcaaaaaggt     300

aaccaaaatg ttgaagttaa attgggtgag actacggtta gcaaaatatt taatattcaa     360

tatttaggtg gagttagaga taattgggga gtaacagcta atggtcgaat tgatacttta     420

aataaagtag atgggaaatt tagtcatttt gcgtacatga aacctaacaa ccagtcgtta     480

agctctgtga cagtaactgg tcaagtaact aaaggaaata aaccaggggt taataatcca     540

acagttaagg tatataaaca cattggttca gacgatttag ctga                      584
```

<210> 91
<211> 545
<212> DNA
<213> Staphylococcus aureus

<400> 91

```
gctggtgtgg tacttatcct agtggcagca tatttgtttg ctaaaccaca tatcgataat      60

tatcttcacg ataaagataa agatgaaaag attgaacaat atgataaaaa tgtaaaagaa     120

caggcgagta aagataaaaa gcagcaagct aaacctcaaa ttccgaaaga taaatcgaaa     180
```

gtggcaggct atattgaaat tccagatgct gatattaaag aaccagtata tccaggacca 240

gcaacacctg aacaattaaa tagaggtgta agctttgcag aagaaaatga atcactagat 300

gatcaaaata tttcaattgc aggacacact ttcattgacc gtccgaacta tcaatttaca 360

aatcttaaag cagccaaaaa aggtagtatg gtgtacttta aagttggtaa tgaaacacgt 420

aagtataaaa tgacaagtat aagagatgtt aagcctacag atgtaggagt tctagatgaa 480

caaaaaggta aagataaaca attaacatta attacttgtg atgattacaa tgaaaagaca 540

ggcgt 545

<210> 92
<211> 527
<212> DNA
<213> Staphylococcus aureus

<400> 92
ttaacaatag aacatttaac aaagaagata ggcaacaaaa cgattctcga agatgtatca 60

tttaagctga aacgcggaca aatagttggt ctcgttggag cgaatggtgc aggtaaaaca 120

actttaatga aagttatatt aggttactct agtttccaaa gcgggaattt taatgttatt 180

aacagcaagg acgaaaaaag caatatcggc gcattgattg aaaatccagg aatatatcct 240

tttatgtctg gatatgaaaa cttgaagtta ttgaatgaat caaaaaacac tcaagatatc 300

gataaaattg tctcacaact tcatatggat gaatacattc ataaaaaagc taaaacgtat 360

tctcttggta tgaaacaaaa attaggaatt gctatagcat ttttaaataa acctcaattc 420

attatcttag atgaaccaat gaatggctta gatccaaaag ctgtgcgaga tgtacgtgaa 480

ttgattgtcc aaaaagcgca agaaggtgtt actttcttaa tttcgag 527

<210> 93
<211> 645
<212> DNA
<213> Staphylococcus aureus

<400> 93
aaatggttca gtcgtaatgg cgacaggtga agttttagaa ggtggaaaga ttagatatac 60

atttacaaat gatattgaag ataaggttga tgtaacggct gaactagaaa ttaatttatt 120

tattgatcct aaaactgtac aaactaatgg aaatcaaact ataacttcaa cactaaatga 180

agaacaaact tcaaaggaat tagatgttaa atataaagat ggtattggga attattatgc 240

caatttaaat ggatcgattg agacatttaa taaagcgaat aatagatttt cgcatgttgc 300 atttattaaa cctaataatg gtaaaacgac aagtgtgact gttactggaa ctttaatgaa 360

aggtagtaat cagaatggaa atcaaccaaa agttaggata tttgaatact tgggtaataa 420

tgaagacata gcgaagagtg tatatgcaaa tacgacagat acttctaaat ttaaagaagt 480

cacaagtaat atgagtggga atttgaattt acaaaataat ggaagctatt cattgaatat 540

agaaaatcta gataaaactt atgttgttca ctatgatgga gagtatttaa atggtactga 600

tgaagttgat tttagaacac aaatggtagg acatccagag caact 645

<210> 94
<211> 548
<212> DNA
<213> Staphylococcus aureus

<400> 94
ggtattgcat ctgtaacttt aggtacatta cttatatctg gtggcgtaac acctgctgca 60

aatgctgcgc aacacgatga agctcaacaa aatgcttttt atcaagtgtt aaatatgcct 120

aacttaaacg ctgatcaacg taatggtttt atccaaagcc ttaaagatga tccaagccaa 180

agtgctaacg ttttaggtga agctcaaaaa cttaatgact ctcaagctcc aaaagctgat 240

gcgcaacaaa ataagttcaa caaagatcaa caaagcgcct tctatgaaat cttgaacatg 300

cctaacttaa acgaagagca acgcaatggt ttcattcaaa gtcttaaaga cgatccaagc 360

caaagcacta acgttttagg tgaagctaaa aaattaaacg aatctcaagc accgaaagct 420

gacaacaatt tcaacaaaga acaacaaaat gctttctatg aaatcttgaa catgcctaac 480

ttgaacgaag aacaacgcaa tggtttcatc caaagcttaa aagatgaccc aagtcaaagt 540

gctaacct 548

<210> 95
<211> 304
<212> DNA
<213> Staphylococcus aureus

<400> 95
gttatcaatt aatacaaccc ctgaagcaat tcgatacatt aaacctgcag attttcatgt 60

tcctggcgat atttcatctg cagcgttctt tattgttgca gcacttatca caccaggaag 120

tgatgtaaca attcataatg ttggaatcaa tccaacacgt tcaggtatta ttgatattgt 180

tgaaaaaatg ggcggtaata tccaactttt caatcaaaca actggtgctg aacctactgc 240

ttctattcgt attcaataca caccaatgct tcaaccaata acaatcgaag gagaattagt 300 tcca 304

<210> 96
<211> 269
<212> DNA
<213> Staphylococcus aureus

<400> 96
gtagttgaaa atatgcctgt tggtgtaggt agttatgtac attatgatcg taaattagat 60

ggaagaatag cacagggtgt cgttagtatt aatgcattta aaggtgtaag ttttggagaa 120

ggatttaaag cagctgaaaa gcctggtagc gaaattcaag acgaaattct ctacaatact 180

gaattgggct attatcgtgg gtcaaatcac ttaggtggtt tagaaggcgg tatgtcaaat 240

ggaatgccaa ttatcgttaa tggtgtaat 269

<210> 97
<211> 305
<212> DNA
<213> Staphylococcus aureus

<400> 97
agacttatta tctaaacgtg gtgaactagc acaaaaaatt ggggaagaaa aattaaaaca 60

aggtacacgt atctatgatc cacaacgtga aaaagaaatg cttaacgact taatcgatag 120

taacaaagga ccattcaacg ataatactat taagcaatta tttaaagaaa ttttcaaagc 180

ctctacagat ttacaaaaat ctgaaaatga aaaacattta tatgtatcac gtaagttgaa 240

acctgaagat acgattgtaa catttgataa tgggggcatt attggagacg gcaataaatc 300

atttg 305

<210> 98
<211> 287
<212> DNA
<213> Staphylococcus aureus

<400> 98
aaaattgctg gtatcgctgc acgtgaagtt aaaggtatct tagacatgaa aggtggctta 60

actgatacat tcactaatgc attctcaagt ggaaataacg ttactcaagg tgtatctgtt 120

gaagttggtg aaaaacaagc tgctgtagac ttaaaagtaa ttttagaata tggtgaatca 180

gcacctaaaa tcttccgtaa agtaactgaa ttagtaaaag aacaagttaa atatattact 240

ggtttagatg ttgttgaagt taacatgcaa gttgacgatg taatgac 287

<210> 99
<211> 429
<212> DNA
<213> Staphylococcus aureus

<400> 99
agctgagacg acacaagatc aaactactaa taaaaacgtt ttagatagta ataaagttaa 60

agcaactact gaacaagcaa aagctgaggt aaaaaatcca acgcaaaaca tttctggcac 120

tcaagtatat caagaccctg ctattgtcca accaaaaaca gcaaataaca aaacaggcaa 180

tgctcaagta agtcaaaaag ttgatactgc acaagtaaat ggtgacactc gtgctaatca 240

atcagcgact acaaataata cgcagcctgt tgcaaagtca acaagcacta cagcacctaa 300

aactaacact aatgttacaa atgctggtta tagtttagtt gatgatgaag atgataattc 360

agaaaatcaa attaatccag aattaattaa atcagctgct aaacctgcag ctcttgaaac 420

gcaatataa 429

<210> 100
<211> 536
<212> DNA
<213> Staphylococcus aureus

<400> 100
cgggattctc tgcattatcc cccacggcaa cacccaaaat aaactcttca atgttaaaaa 60

caagacacaa atgactgata atactaagtt tattaatatt gatacgaaca caccaaagta 120

tcgagttaat aaaaagttga gcggtatcaa tggtagagat actacataca tcaacaatat 180

tgtcaccaat aacaacatag cattaaccgg atgtggatta ataattaggt cacctatata 240

agcaataata aatactaaaa agcaatgtac caaaaatgct attgataaaa tgaaaatctt 300

tgctcttatt tcttttgtaa tcgaccaatt attacttaag taataattaa atgatttatt 360

tctcatttca attttaaata acgaattaca agccatacat aatacaatcg ggatgaaagc 420

aattggccaa atattaaata gtaaagttat atatggtgac acactattcg ctgttcccgt 480

attacttttg gcgaataaga ctgtgaaaat agcaaaacaa agaaatacca gcggac 536

<210> 101
<211> 637
<212> DNA
<213> Staphylococcus aureus

<400> 101
ttaattgttc taccgctcca tttattaaat cctttaaaga gtaaaactgc taatagcaac 60

gtgataataa tatagattgc caatgttaat gtaactggta tactcccttc gataaacata 120

taaacgtaac gtgtagcata tgtgattggt aaatagaacc acgaatgatc tccaagcact 180

tctaatccaa aataaacgtt aaaaataaac attaaaactc cgacaacaat agccattaca 240

tctttaatga aaatactaaa aataaaaagt agcagtaata taattacatt gaaaaacaat 300

gatacgccta taaacataag tgttattttc atatcatgtg aatgccacaa taaattaatt 360

gatgctaata gaatacatat ggctgtaata gtataagtaa aaatcattga tgcatttaac 420

caatttagcc tattagcttt tcctaaaata tgattaaagt gaccaatatt ttcttcaaaa 480

ttgataactt gatagacgtt tatagaaatt aatagcgatg taattgcatt aaaactcgct 540

gtaaacaaac ttatttgtcg accattccat aaatttacgt ttaaatacca atttataaat 600

aatataaaca atatggttac aataatgggt acaaatg 637

<210> 102
<211> 507
<212> DNA
<213> Staphylococcus aureus

<400> 102
aaagataatt ggtttgctga aaaaccagtc ctctaaagaa tcgaatgtta agattcatcg 60

cttggcgtat attacaaact caaaatttga tggcaataac tatatagata gatggtgtaa 120

aatcaggaat tctcacattg gtgaatacag ttatattgga tttggtagtg attttaataa 180

tgtagaagta ggaagatatt gttcgatatc ttcggatgta aaaattgggt taggaaaaca 240

tcctacacac ttttttagct catcaccgat tttttattct aataataatc catttaacat 300

aaagcaaaag tttatagact ttaatgacca accaagccgt acaacaatta aaaatgatgt 360

gtggattggt gcaaatgtaa ttattatgga tggtttaaca ataaatactg gtgcagtcat 420

agcagccggc tcagttgtta ctaaaaatgt aggagcatat gaggttgttg gtggggttcc 480

tgcaaaagtg attaagaagc gatttga 507

<210> 103
<211> 639
<212> DNA
<213> Staphylococcus aureus

<400> 103
caagggtact taaacaaata gaaacaatta aagacgttac ggatgattat aaaattgttg 60

gaatgaataa ttcacaagct actaataagc gattggaaaa tttagattgt aattatcgtt 120 tgttaggtag caaggtagat ccaaaaaata ttctttctaa attaattaag cgtataagat 180

ttgcaacagg tgttatccga gaaattaaag cttataaacc tgacgtgatt catgcaaatg 240

atttcgacgt attattaatg gtctatttaa gcaattataa aaaagctaat attgtttatg 300

atgcgcatga aatatatgcg aaaaatgcct ttattaataa agttccactt atttcaaagt 360

ttgtagaaag tatagaaaaa cacatagtaa aacatcgtgt taatgccttc gtaacagtaa 420

gtcatgcagc aaaagaatat tatcaatcta aaggatataa gaaggaagcg aatgttatta 480

cgaatgcacc tattttaaat gatagcagag aatttaaaga aatcgaaaac tttaaagaaa 540

ttgtatatca aggtcaaatt gtaatggaca gaggatatga agagtttatt attgcttcat 600

cagcttttaa acaaaatgct ccttcattca taattcgag 639

<210> 104
<211> 380
<212> DNA
<213> Staphylococcus aureus

<400> 104
actttgtgca attatcagca tgaacatatt tatagtaatc tctacattta ctaaagaagt 60

attagggttc cctatagagc cggtgtatta ctcaaccatg gttggtatag cattaattac 120

cacggtgttt gctatttata agataattgt cacgcaagaa attccgcgag ggttaatatt 180

attaattgct atatgtttgc tttatctagc tttttattat ttttcaccag ataaggaaga 240

gaaactagct aaaaataata ttctattctt tttaacatgg gcagttccag cggcaattag 300

tggtatttat attaaatata taaacaaggc tacggtagaa agatttttta aattagtatt 360

tttcatattt tctgtttcat 380

<210> 105
<211> 500
<212> DNA
<213> Staphylococcus aureus

<400> 105
ttatggatag cgtaaagaca ataattggta cgttgcttat agctttagga ttacaatttt 60

tagcttatcc aattattaat caacgagtag gtaatgaagc gtttggttct attttaacga 120

tttatacaat aataacaatc acgagtgttg tattaggcaa tacgcttaac aatatacgat 180

tgattaatat gaatctatac aaatccaatc attactactg gaaatttgtg tcgatacttt 240

taatttcaat tctgattgag agtatagctt taattattgt atttctttac ttttttaatt 300 tgaacaccat cgatattatc tttttaattc tacttaatat tttaatgtgt ttaaggattt 360

atctgaatgt attttttagg atgactttaa aatataatca gattttgtat attgctctta 420

ttcaattttt aggtttgctg ataggactat ttctatatta tttaatccaa aactggattg 480

tttgttttat taccagtgaa 500

<210> 106
<211> 522
<212> DNA
<213> Staphylococcus aureus

<400> 106
gattcttggc gctactaaca ttaagcatat gtcattatta tcacattatt taaaccacat 60

tgatttgaat atcaatgagg tggacattat atacactgac aaatatgata tcgaagaaca 120

tatccaaggc atcaataatt actataaata taaagtagat attaaagaag attggacatt 180

tatcaaaaaa gctattgctt actatcgatt taggccatac gctatgaaaa ttcttaaaga 240

aaatcgttat gattttgtca tagtatgggg aagttataca ggacacttat ttaaaagttt 300

tttagaaaaa cactataaaa ataaattcat tttaaatata agggactact tttttgaaaa 360

taataaactt attaagtata gaatgaaaaa aatcgttgat gctagcaggg tgacaacatt 420

atcttcagaa ggttttctta aatttttacc taaatctgaa aaatatagaa ttatttatag 480

ttataacatg agtattatta gagaaagtaa tgtaaccgat gg 522

<210> 107
<211> 655
<212> DNA
<213> Staphylococcus aureus

<400> 107
taatgtttcc ttgccttatg ttaggtgata aacctttatt atttttagca cctataagtt 60

atggagtagg aaagctcttt ataagcttct cgaataatcc gaattttaaa ttttcgaaaa 120

ttgtatacga tgttttaggt tttcttagat tagtatttat acctgctatg atagtgtttt 180

tccaggattc aactatagat aatttaccat taggacaagc ttattttaat caagcggtta 240

tttatatgag tgtggagttt atcataggct cgctatttat attgatacta tctaaattat 300

tcaaacatga agtggtatca agaaatagct ttacactttc tggatcatca atttattaca 360

ttgtgtttgg tcttgttatt tgtgggattt ttgtagcttt tcccgaagtg cgcaaaaaca 420

tatcattttt aattattaaa acagatgcaa tgggaagagg aaccgaagca acaagtggtt 480 taaatgttct ttttgtaatg ctatttcaac ttgccttagc gttattattc ttaataatcg 540

catatgcttc atataaaaag tataaagaga atcctaaaat tatttatgtt gtattaccgc 600

tagctatagg aattttaaat attagtttaa ttgttggtga aagaagaagt tatca 655

<210> 108
<211> 459
<212> DNA
<213> Staphylococcus aureus

<400> 108
gtaaaaacat ttatgaaatc gaaaatattt agattaatga atacaccact attattattt 60

tataagaaag aatatttaac tggatattat tttgaaaata aagtggctgg atggttatgg 120

gcgtggaaag ctgttccgtt caagttgtta ggaataaata caagtttgcc atttcctgca 180

gatataactg ttagaatgca taaccctaat aacattgttt ttgataaaaa tgatattcat 240

atttttcaat cgcccgggac gtattttaat aatttttcag cagttatata tataggtaga 300

ggtgtttata tagcgcctaa cgtaggtatt attacagcta atcataatat taaaaatttg 360

aagtcacatg caccaggtga agatgtcaaa atagggaatt atagttggat tggaatgaac 420

tcagttatat taccaggagt agaattgggg gaacataca 459

<210> 109
<211> 562
<212> DNA
<213> Staphylococcus aureus

<400> 109
aagatacgat ttgttgattg tgaataccaa aaatgaccgt agtgctaata tactttcaca 60

aatcagtttt ttgatatcat tgcttatttt attaatactg ataccaatat ttgcgattag 120

tgcatgttta tacccaaact ttatattaga ttttattttc attattatta tgttgttttt 180

ggtaagttta acaaacattt ttacaaatta tctaaataag gaaagaaagt ataaagtgtt 240

aagtttgatt aatgtgttta gagctggatc aatggcttta cttcaaatca ttttcggact 300

tttagcatta ggaagtttag gattaattat tggtttttca ttatcctata tcgcaggcat 360

tacactagga tataaaacgt ttaaaaagca ctttaatatt gtgagagata aagaagaaac 420

taaagcatta tttttagaaa ataaaaatca gttagtttat tcaacaccat caatattatt 480

aaatagtttg tctttctcgg ttgttgtgtt ctttataggt attttgtata ccaatacaga 540

agtgggtatt tatggtatgg cc 562

<210> 110
<211> 104
<212> DNA
<213> Staphylococcus aureus

<400> 110
ttttatctta attaaggaag gagtgatttc aatggcacaa gatatcattt caacaatcag 60

tgacttagta aaatggatta tcgacacagt gaacaaattc acta 104

<210> 111
<211> 351
<212> DNA
<213> Staphylococcus aureus

<400> 111
aaatatcaaa tcgctgtggc tgatacgaat gttcaaacgc cagattatga aaagttgagg 60

aacacatggc tggacgttaa ctatggttat gataagtatg atgagaagaa tgacgcaatg 120

aagaagaagt ttgaggctac ggagaatgag gcaaagaaat tacttagtga gatgaaaact 180

gaaagtgata ggaaatactt gtgggaaaac tcaaaagatt tagatacgaa gtctgcggat 240

atgactcgta cctatcgtaa tattgagaaa atcgcagaag cgatgaagca taaagatact 300

aagttaaaaa tagatgaaaa caagaagaaa gtgaaagatg cccttgagtg g 351

<210> 112
<211> 278
<212> DNA
<213> Staphylococcus aureus

<400> 112
gggttcttgc tgtctttaag tgattcagag aatacttctt gtgcacgttc tgggtgttcg 60

cgtaatgttt tgatgtattg gttacgttgt tcttctgtga taccttttag atgtaatact 120

tgataaaaag ctttttgttg atctgttacg tagttgtttt gagttgtttg gtgcttagtt 180

gaagtttgtt gcgtgttttc actcgctttt gcttccccat ttgaaatcat tgtagctaaa 240

gtaattgttg ctgccccaac tagcaacttc gagatata 278

<210> 113
<211> 226
<212> DNA
<213> Staphylococcus aureus

<400> 113
aaagatagtt ctaagataaa tggtccatta agactcgcag gtggagatat taataagcta 60

gattcaacaa ctcaagacaa agtaagaaga ttagattcat ctatttctaa atctactact 120

cctgaatctg tatacgttta tagactttta aatttagatt atttgacaag tatcgttgga 180

tttacaaatg aagatttata taaattacaa cagaccaata atggcc 226

<210> 114
<211> 576
<212> DNA
<213> Staphylococcus aureus

<400> 114
gctagtgcat ttgttattca agacgaactg atgcaaaaaa accatgcaaa agcagaagtt 60

tcagcagaag aaataaaaaa acatgaagag aaatggaata agtactatgg tgtcaatgca 120

tttaatttac caaaagagct tttagtaaa gttgatgaaa aagatagaca aaagtatcca 180

tataatacta taggtaatgt ttttgtaaaa ggacaaacaa gtgcaactgg tgtgttaatt 240

ggaaaaaata cagttctaac aaatagacat atcgctaaat ttgctaatgg agatccatct 300

aaagtatctt ttagaccttc tataaataca gatgataacg gtaatactga aacaccatat 360

ggagagtatg aagtcaaaga aatattacaa gaaccatttg gtgcaggtgt tgatttagca 420

ttaatcagat taaaaccaga tcaaaacggt gtttcattag gcgataaaat atcgccagca 480

aaaataggga catctaatga tttaaaagat ggagacaaac tcgaattaat aggctatcca 540

ttcgatcata aagttaacca aatgcacaga agtgaa 576

<210> 115
<211> 630
<212> DNA
<213> Staphylococcus aureus

<400> 115
ttttagcagc gtcaattttt actatttcct tacctgtgat tccttttgaa agtacattac 60

aagcaaaaga atacagcgca gaagaaatca gaaaattaaa acaaaaattt gaggttccac 120

ctacagataa agagctttat acacacatta cggataatgc aagaagtcct tataattctg 180

ttggtacagt gtttgtcaaa ggtagtacat tagctaccgg agttttaatt ggtaaaaata 240

caattgttac taattaccac gttgcaagag aagcagccaa aaacccatcg aatattattt 300

ttacacccgc tcaaaataga gatgcagaaa aaaatgaatt ccctactccg tatggaaaat 360

ttgaagctga agaaattaaa gaatctccgt atggacaagg actcgattta gctataataa 420

aattaaaacc aaacgaaaaa ggggaatcag cgggagattt aattcaacca gctaatatac 480 ctgatcatat tgatatacaa aaaggagaca aatattcttt attaggatat ccttataatt 540

attcagctta ctctttatat caaagtcaga ttgaaatgtt caatgattct caatattttg 600

gatatactga ggtaggaaac tctggatcag 630

<210> 116
<211> 330
<212> DNA
<213> Staphylococcus aureus

<400> 116
agaaagaaag tgatttctat gattaaaaat aaaatattaa cagcaacttt agcagttggt 60

ttaatagccc ctttagccaa tccatttata gaaatttcta aagcagaaaa taagatagaa 120

gatatcggcc aaggtgcaga aatcatcaaa agaacacaag acattactag caaacgatta 180

gctataactc aaaacattca atttgatttt gtaaaagata aaaaatataa caaagatgcc 240

ctagttgtta agatgcaagg cttcattagc tctagaacaa catattcaga cttaaaaaaa 300

tatccatata ttaaaagaat gatatggcca 330

<210> 117
<211> 350
<212> DNA
<213> Staphylococcus aureus

<400> 117
tcgttacacc gaatggtcaa gtatctgcat atgatcaata cttatttgca caagacccaa 60

ctggtccagc agcaagagac tatttcgtcc cagataatca actacctcct ttaattcaaa 120

gtggctttaa tccatcattt attacaacat tgtcacacga aaaaggtaaa ggtgataaaa 180

gcgagtttga aatcacttac ggcagaaaca tggatgctac atatgcatac gtgacaagac 240

ctcgtttagc cgttgataga aaacatgatg cttttaaaaa ccgaaacgtt acagttaaat 300

atgaagtgaa ctggaaaaca catgaagtaa aaattaaaag catcacacct 350

<210> 118
<211> 221
<212> DNA
<213> Staphylococcus aureus

<400> 118
tttaagcgta ctatcacaca gacaagatgg cgctaaaaaa tctaaaatta cagtaactta 60

tcaacgtgaa atggatttat accaaattcg ttggaatggc ttctactggg caggcgcgaa 120

ttataaaaac tttaaaacta gaacatttaa atcaacatat gaaattgatt gggaaaatca 180 caaagtgaaa ttgttagata caaaagaaac tgaaaacaat a 221

<210> 119
<211> 337
<212> DNA
<213> Staphylococcus aureus

<400> 119
ttgatagcga tttatttgta ggctacaaac ctcatagtaa agatcctaga gattatttcg 60

ttccagacag cgagttacca cctcttgtac aaagtggatt taacccttca tttatcgcaa 120

cagtatctca cgaaaaaggt tcaagcgaca cgagcgaatt tgaaatcact tatggaagaa 180

atatggatgt cactcatgcc attaaaagat caacacatta tggcaacagt tatttagatg 240

gtcatagagt ccataatgca tttaaaaata gaaactacac tgtgaaatat gaagtcaatt 300

ggaagactca cgaaatcaaa gtgaaaggac agaattg 337

<210> 120
<211> 752
<212> DNA
<213> Staphylococcus aureus

<400> 120
gtcagctcag taacaacaac actattgcta ggttccatat tgatgaatcc tgtcgctggt 60

gccgcagatt ctgatattaa tattaaaacc ggtactacag atattggaag caatactaca 120

gtaaaaacag gtgatttagt cacttatgat aaagaaaatg gcatgcacaa aaaagtattt 180

tatagtttta tcgatgataa aaatcacaat aaaaaactgc tagttattag aacgaaaggt 240

accattgctg gtcaatatag agtttatagc gaagaaggtg ctaacaaaag tggtttagcc 300

tggccttcag cctttaaggt acagttgcaa ctacctgata atgaagtagc tcaaatatct 360

gattactatc caagaaattc gattgataca aaagagtata tgagtacttt aacttatgga 420

ttcaacggta atgttactgg tgatgataca ggaaaaattg gcggccttat tggtgcaaat 480

gtttcgattg gtcatacact gaaatatgtt caacctgatt tcaaaacaat tttagagagc 540

ccaactgata aaaaagtagg ctggaaagtg atatttaaca atatggtgaa tcaaaattgg 600

ggaccatatg atagagattc ttggaacccg gtatatggca atcaactttt catgaaaact 660

agaaatggtt ctatgaaagc agcagataac ttccttgatc ctaacaaagc aagttctcta 720

ttatcttcag ggttttcacc agacttcgct ac 752

<210> 121
<211> 507
<212> DNA
<213> Staphylococcus aureus

<400> 121
tgttatcgac cgttttgtat ccaaattggg ggcaatataa acgcgctgat ttaatcggac 60

aatcttctta tattaaaaat aatgatgtcg taatattcaa tgaagcattt gataatggtg 120

cttcagacaa attattaagt aatgtgaaaa aagaatatcc ttaccaaaca cctgtactcg 180

gtcgttctca atcaggttgg gacaaaactg aaggtagcta ctcatcaact gttgctgaag 240

atggtggcgt agcgattgta agtaaatatc ctattaaaga gaaaatccag catgttttca 300

aaagcggttg tggattcgat aatgatagca acaaaggctt tgtttataca aaaatagaga 360

aaaatggtaa gaacgttcac gttatcggta cacatacaca atctgaagat tcacgttgtg 420

gtgctggaca tgatcgaaaa attagagctg aacaaatgaa agaaatcagt gactttgtta 480

aaaagaaaaa tatccccaaa gatgaaa 507

<210> 122
<211> 213
<212> DNA
<213> Staphylococcus aureus

<400> 122
ggtgtcctat ctcgaaaaca aaacgctgca aaaaaatcaa aaattactgt tacttatcaa 60

agtgaaatgg atagatatac aaacttttgg atcaacttca actggatagg taataattat 120

aaagatcaca taagagcaac tcatacatca atttatgaag ttgattggga aaatcataca 180

gttaaattaa tagatactca atctaaggaa aaa 213

<210> 123
<211> 220
<212> DNA
<213> Staphylococcus aureus

<400> 123
ataaagaaag gaaatgattt tatggtcaaa aaaagactat tagctgcaac attgtcgtta 60

ggaataatca ctcctattgc tacttcgttt catgaatcta aagctgataa caatattgag 120

aatattggtg attgcgctga ggtagtcaaa agaacagaag atacaagttg cgataagtgg 180

ggggtcacac aaaatattca gtttgatttt gttaaagata 220

<210> 124

<211> 359
<212> DNA
<213> Staphylococcus aureus

<400> 124
atcattaggt aaaatgtctg gacatgatcc aaatttattt gttggatata aaccatatag 60

tcaaaatccg agagactatt ttgtgccaga caatgaatta cccccattag tacacagtgg 120

tttcaatcct tcatttattg caactgtttc tcatgaaaaa ggctcaggag atacaagtga 180

atttgaaata acgtatggca gaaatatgga tgttactcat gctactagaa gaacaacaca 240

ctatggcaat agttatttag aaggatctag aatacacaag gcatttgtaa acagaaatta 300

cacagttaaa tatgaagtga actggaaaac tcatgaaatt aaagtgaaag gacataatt 359

<210> 125
<211> 612
<212> DNA
<213> Staphylococcus aureus

<400> 125
aagttgctca aatacaagct ggtttacaat ataaaccaca agtacaacgt gtaccaggta 60

agtggacaga tgctaacttt aatgatgtta agcatgcaat ggatacgaag cgtttagctc 120

aagatccagc attaaaatat caattcttac gcttagacca accacaaaat atttctattg 180

ataaaattaa tcaattctta aaaggtaaag gtgtattaga aaaccaaggt gctgcattta 240

acaaagctgc tcaaatgtat ggcattaatg aagtttatct tatctcacat gccctattag 300

aaacaggtaa cggtacttct caattagcga aaggtgcaga tgtagtgaac aacaaagttg 360

taactaactc aaacacgaaa taccataacg tatttggtat tgctgcatat gataacgatc 420

ctttacgtga aggtattaaa tatgctaaac aagctggttg ggacacagta tcaaaagcaa 480

tcgttggtgg tgctaaattc atcggcaact catatgtaaa agctggtcaa aatacacttt 540

acaaaatgag atggaatcct gcacatccag gaacacacca atatgctaca gatgtagatt 600

gggctaacat ca 612

<210> 126
<211> 401
<212> DNA
<213> Staphylococcus aureus

<400> 126
tgttattatt ctcattttct tcaattacta atgaggtaag tgcatcaagt tcattcgaca 60

aaggaaaata taaaaagggc gatgacgcga gttattttga accaacaggc ccgtatttga 120 tggtaaatgt gactggagtt gatggtaaag gaaatgaatt gctatcccct cattatgtcg 180

agtttcctat taaacctggg actacactta caaaagaaaa aattgaatac tatgtcgaat 240

gggcattaga tgcgacagca tataaagagt ttagagtagt tgaattagat ccaagcgcaa 300

agatcgaagt cacttattat gataagaata agaaaaaaga agaaacgaag tctttcccta 360

taacagaaaa aggttttgtt gtcccagatt tatcagagca t 401

<210> 127
<211> 715
<212> DNA
<213> Staphylococcus aureus

<400> 127
ttttattcat tgccctaacg ttgacaacaa gtccacttgt aaatggtagc gagaaaagcg 60

aagaaataaa tgaaaaagat ttgcgaaaaa agtctgaatt gcagggaaca gctttaggca 120

atcttaaaca aatctattat tacaatgaaa aagctaaaac tgaaaataaa gagagtcacg 180

atcaattttt acagcatact atattgttta aaggcttttt tacagatcat tcgtggtata 240

acgatttatt agtagatttt gattcaaagg atattgttga taaatataaa gggaaaaaag 300

tagacttgta tggtgcttat tatggttatc aatgtgcggg tggtacacca aacaaaacag 360

cttgtatgta tggtggtgta acgttacatg ataataatcg attgaccgaa gagaaaaaag 420

tgccgatcaa tttatggcta gacggtaaac aaaatacagt acctttggaa acggttaaaa 480

cgaataagaa aaatgtaact gttcaggagt tggatcttca agcaagacgt tatttacagg 540

aaaaatataa tttatataac tctgatgttt ttgatgggaa ggttcagagg ggattaatcg 600

tgtttcatac ttctacagaa ccttcggtta attacgattt atttggtgct caaggacagt 660

attcaaatac actattaaga atatatagag ataataaaac gattaactct gaaaa 715

<210> 128
<211> 233
<212> DNA
<213> Staphylococcus aureus

<400> 128
cgtagatgtg tttggagcta attattatta tcaatgttat ttttctaaaa aaacgaatga 60

tattaattcg catcaaactg acaaacgaaa aacttgtatg tatggtggtg taactgagca 120

taatggaaac caattagata aatatagaag tattactgtt cgggtatttg aagatggtaa 180

aaatttatta tcttttgacg tacaaactaa taagaaaaag gtgactgctc aag 233

<210> 129
<211> 360
<212> DNA
<213> Staphylococcus aureus

<400> 129
aatttttggc acatgattta atttataaca ttagtgataa aaaactgaaa aattatgaca 60

aagtgaaaac agagttatta aatgaaggtt tagcaaagaa gtacaaagat gaagtagttg 120

atgtgtatgg atcaaattac tatgtaaact gctatttttc atccaaagat aatgtaggta 180

aagttacagg tggcaaaact tgtatgtatg gaggaataac aaaacatgaa ggaaaccact 240

ttgataatgg gaacttacaa aatgtactta taagagttta tgaaaataaa agaaacacaa 300

tttcttttga agtgcaaact gataagaaaa gtgtaacagc tcaagaacta gacataaaag 360

<210> 130
<211> 501
<212> DNA
<213> Staphylococcus aureus

<400> 130
ccacctgttg aaggaagagg agttattaat tctagacagt ttttatctca tgatttaatt 60

tttccaattg agtataagag ttataatgag gttaaaactg aattagaaaa tacagaatta 120

gctaacaatt ataaagataa aaaagtagac atttttggcg ttccatattt ttatacatgt 180

ataataccta aatctgaacc ggatataaac caaaattttg gaggttgttg tatgtatggt 240

ggtcttacat ttaatagttc agaaaatgaa agagataaat taattactgt acaggtaaca 300

atcgacaata gacaatcact tggatttaca ataactacaa ataagaatat ggttactatt 360

caggaactag attacaaagc aagacactgg ctcactaaag aaaaaaagct atacgagttt 420

gatggttctg catttgaatc tggatatata aaatttactg aaaagaacaa tacaagtttt 480

tggtttgact tatttcctaa a 501

<210> 131
<211> 542
<212> DNA
<213> Staphylococcus aureus

<400> 131
gaagatttac acgataaaag tgagttaaca gatttagctt tagctaatgc atatggtcaa 60

tataatcacc cattcattaa agaaaatatt aagagtgatg aaataagtgg agaaaaagat 120 ttaatattta gaaatcaagg tgatagtggc aatgatttga gagtaaagtt tgcaactgct 180

gatttagctc agaagtttaa aaataaaaat gtagatatat atggggcatc tttttattat 240

aagtgtgaaa aaataagtga aaatatttct gaatgtctat atggaggtac aacactaaat 300

agtgaaaaat tggcacagga aagggtgatt ggtgctaatg tttgggtaga tggtattcaa 360

aaagaaacag aattaatacg aacaaataag aaaaatgtga cattgcaaga attagatata 420

aagatcagaa aaatattgtc cgataaatat aaaatttatt ataaagacag cgaaataagt 480

aaaggtctaa ttgaatttga tatgaaaact cctagagatt actcattcga catttatgat 540

tt 542

<210> 132
<211> 343
<212> DNA
<213> Staphylococcus aureus

<400> 132
agtcttatct aacggcgatg taggtccagg aaatctaaga aatttttata ctaaatatga 60

atatgtgaat ttaaagaatg ttaaagacaa aaattcacca gaatcacacc gcttagaata 120

ctcgtataaa aatgatacat tgtatgctga atttgacaat gaatatataa ctagtgatct 180

aaagggaaaa aatgtcgatg tttttggtat aagctataaa tatggttcta actctcgtac 240

tatatatggt ggtgttacta aagcagaaaa caataaatta gattcgccaa gaataatacc 300

tataaattta attatcaatg gcaagcatca aacagttaca act 343

<210> 133
<211> 272
<212> DNA
<213> Staphylococcus aureus

<400> 133
ggatataaat acggaaataa agttacattt atagataatt ctcaacaaat tgatgttaca 60

ttgacaggaa atgaaaaatt aactgttaaa gatgatgacg aagtttctaa tgttgacgtg 120

tttgtagtaa gagaaggtag tgacaaatca gctatcacaa catcgattgg tggaattaca 180

aagacaaatg ggactcaaca taaagatact gttcaaaacg ttaatttgtc agtttctaag 240

agtacaggtc aacacactac ttctgtgact tc 272

<210> 134
<211> 450
<212> DNA

<213> Staphylococcus aureus

<400> 134
atgaaattta aagcgatagc aaaagcaagt ttagcattgg gaatgttagc aacaggtgta 60

attacatcga atgtacaatc agtacaagcg aaaacagaag ttaaacaaca aagtgaatca 120

gagttgaaac actattataa taaaccggtt ttagagcgta aaaatgttac tggatataaa 180

tatactgaaa aaggtaaaga ttatatagat gttatagtag acaatcaata ttctcaaatt 240

tctttagttg gatctgataa agacaaattt aaagatggag acaactcgaa tatagatgtg 300

tttatcctta gagaaggtga cagtagacaa gcaacaaatt actcaattgg tggcgtaaca 360

aaaacaaaca gtcaaccttt tattgactat atacacacac caatccttga aatcaagaaa 420

ggtaaagaag aaccacaaag tagtttatac 450

<210> 135
<211> 500
<212> DNA
<213> Staphylococcus aureus

<400> 135
gtattgaata taaaaatgtg acaggttata tcagtttcat tcaaccaagt attaaattta 60

tgaatatcat agatggtaat tctgttaata accttgcttt aattggcaaa gataagcaac 120

attatcatac gggtgtacat cgtaatctta atatatttta cgttaatgag gataagagat 180

ttgaaggtgc aaagtactct attgggggta tcactagtgc aaacgataaa gctgtcgacc 240

taatagcaga agcaagagtt attaaagcag atcatattgg tgaatatgat tatgactttt 300

tcccatttaa aatagttaaa gaagcgatgt cattgaaaga gattgatttt aaattaagaa 360

aataccttat tgataattat ggtctttacg gtgaaatgag tacagggaaa attaccgtca 420

aaaagaaata ctatggaaag tatacatttg aattggataa aaagttacaa gaagaccgta 480

tgtccgatgt tatcaatgtc 500

<210> 136
<211> 384
<212> DNA
<213> Staphylococcus aureus

<400> 136
gcgcaattac agtaacgacg caatcggtca aagcagaaaa aatacaatca actaaagttg 60

acaaagtacc aacgcttaaa gcagagcgat tagcaatgat aaacataaca gcaggtgcaa 120

attcagcgac aacacaagca gctaacacaa gacaagaacg cacgcctaaa ctcgaaaagg 180 caccaaatac taatgaggaa aaaacctcag cttccaaaat agaaaaaata tcacaaccta 240

aacaagaaga gcagaaatcg cttaatatat cagcaacgcc agcgcctaaa caagaacaat 300

cacaaacgac aaccgaatcc acaacgccga aaactaaagt gacaacacct ccatcaacaa 360

acacgccaca accaatgcaa tcta 384

<210> 137
<211> 270
<212> DNA
<213> Staphylococcus aureus

<400> 137
tttaaaagtt agttctttat tcgttgcaac tttgacaaca gcgacacttg tgagttctcc 60

agcagcaaac gcgttatctt caaaggctat ggacaatcat ccacaacaaa cgcagtcaag 120

caaacagcaa acacctaaga ttcaaaaagg cggtaacctt aaaccattag aacaacgtga 180

acacgcaaat gttatattac caaataacga tcgtcaccaa atcacagata caacgaatgg 240

tcattatgca cccgtaactt atattcaagt 270

<210> 138
<211> 556
<212> DNA
<213> Staphylococcus aureus

<400> 138
tttttatcgt aagccctttg ttgcttgcga caatcgctac agattttacc cctgttccct 60

tatcatctaa tcaaataatc aaaactgcaa aagcatctac aaacgataat ataaaggatt 120

tgctagactg gtatagtagt gggtctgaca cttttacaaa tagtgaagtt ttagataatt 180

ccttaggatc tatgcgtata aaaaacacag atggcagcat cagccttata atttttccga 240

gtccttatta tagccctgct tttacaaaag gggaaaaagt tgacttaaac acaaaaagaa 300

ctaaaaaaag ccaacatact agcgaaggaa cttatatcca tttccaaata agtggcgtta 360

caaatactga aaaattacct actccaatag aactaccttt aaaagttaag gttcatggta 420

aagatagccc cttaaagtat tggccaaagt tcgataaaaa acaattagct atatcaactt 480

tagactttga aattcgtcat cagctaactc aaatacatgg attatatcgt tcaagcgata 540

aaacgggtgg ttattg 556

<210> 139
<211> 532

<212> DNA
<213> Staphylococcus aureus

<400> 139
gaaagtattc tgtaggtact gcttcaattt tagtagggac aacattgatt tttgggttaa 60

gtggtcatga agctaaagcg gcagaacata cgaatggaga attaaatcaa tcaaaaaatg 120

aaacgacagc cccaagtgag aataaaacaa ctaaaaaagt tgatagtcgt caactaaaag 180

acaatacgca aactgcaact gcagatcagc ctaaagtgac aatgagtgat agtgcaacag 240

ttaaagaaac tagtagtaac atgcaatcac cacaaaacgc tacagctaat caatctacta 300

caaaaactag caatgtaaca acaaatgata aatcatcaac tacatatagt aatgaaactg 360

ataaaagtaa tttaacacaa gcaaaagatg tttcaactac acctaaaaca acgactatta 420

aaccaagaac tttaaatcgc atggcagtga atactgttgc agctccacaa caaggaacaa 480

atgttaatga taaagtacat ttttcaaata ttgacattgc gattgataaa gg 532

<210> 140
<211> 622
<212> DNA
<213> Staphylococcus aureus

<400> 140
cgggcaaata aataaagatg taacagatat aaaaatatat caagttccta aaggttatac 60

attaaataaa ggatacgatg tgaatactaa agagcttaca gatgtaacaa atcaatactt 120

gcagaaaatt acatatggcg acaacaatag cgctgttatt gattttggaa atgcagattc 180

tgcttatgtt gtaatggtta atacaaaatt ccaatataca aatagcgaaa gcccaacact 240

tgttcaaatg gctactttat cttcaacagg taataaatcc gtttctactg gcaatgcttt 300

aggatttact aataaccaaa gtggcggagc tggtcaagaa gtatataaaa ttggtaacta 360

cgtatgggaa gatactaata aaaacggtgt tcaagaatta ggagaaaaag gcgttggcaa 420

tgtaactgta actgtatttg ataataatac aaatacaaaa gtaggagaag cagttactaa 480

agaagatggg tcatacttga ttccaaactt acctaatgga gattaccgtg tagaattttc 540

aaacttacca aaaggttatg aagtaacccc ttcaaaacaa ggtaataacg aagaattaga 600

ttcaaacggc ttatcttcag tt 622

<210> 141
<211> 892
<212> DNA
<213> Staphylococcus aureus

<400> 141
aaagttggcg atggtaaaga taatgtggca gcagcgcatg acggtaaaga tattgaatat 60

gatacagagt ttacaattga caataaagtc aaaaaaggcg atacaatgac gattaattat 120

gataagaatg taattccttc ggatttaaca gataaaaatg atcctatcga tattactgat 180

ccatcaggag aggtcattgc taaaggaaca tttgataaag caactaagca aatcacatat 240

acatttacag actatgtaga taaatatgaa gatataaaat cacgcttaac tctatattcg 300

tatattgata aaaaaacagt tccaaatgag acaagtttga atttaacatt tgctacagca 360

ggtaaagaaa caagccaaaa tgtcactgtt gattatcaag atccaatggt ccatggtgat 420

tcaaacattc aatctatctt tacaaaatta gatgaagata agcaaactat tgaacaacaa 480

atttatgtta acccattgaa aaaatcagca accaacacta aagttgatat agctggtagt 540

caagtagatg attatggaaa tattaaacta ggaaatggta gcaccattat tgaccaaaat 600

acagaaataa aggtttataa agttaactct gatcaacaat tgcctcaaag taatagaatc 660

tatgatttta gtcaatacga agatgtaaca agtcaatttg ataataaaaa atcatttagt 720

aataatgtag caacattgga ttttggtgat attaattcag cctatattat caaagttgtt 780

agtaaatata cacctacatc agatggcgaa ctagatattg cccaaggtac tagtatgaga 840

acaactgata aatatggtta ttataattat gcaggatatt caaacttcat cg 892

<210> 142
<211> 747
<212> DNA
<213> Escherichia coli

<400> 142
gtttgggact tattgctctg gcggtgggta atgcatatgc aacacaattg ttggatgatt 60

atagtataat ttcctatatg actgatgaag aatcgccgat tgaaatcaaa gataataatc 120

cgataagtaa tggagagtat ctaaccactg aagacgaaag ccatgctgtg aaagtggatg 180

acggtgtaac tggatatata aataatgcca gtgtgatgac tagtggtgat ggatcttatg 240

gtatttctgt tgatagtcaa aacaaagtat tatatataag cgatagcgat attaagacct 300

ctggaagcgt atctgacaaa gaaaatggag ggataacagc cagcgcagta gtcagtgaat 360

ttggtggcac catctttatg aatggtgata attcagtcga gtcgggtggg gcatattcag 420

cgggactttt aagccaggtt aatgattctg aaaagatggt aaataacacc cgtcttgaaa 480

ccacagataa aacgaacatt gttacctctg ggaaaatgc agtaggtgtt cttgcatgtt 540 caagtcctgg agagtctcga acatgtgtcg atgctgtaga tgatgaagtt agtgattcta 600

acagttacga agttattagc cgtgctgatt taaaaatgaa tggtggttcc ataacaacta 660

atggcattaa tagctatggt gcttatgcta atgggaaaaa agcatatatt aatttagatt 720

atgtggcact tgaaactgtg gctgatg 747

<210> 143
<211> 621
<212> DNA
<213> Escherichia coli

<400> 143
agcctggtga cgacttatct ggtggtgctg aacttcgcga ttttgccgag cctccagcag 60

tttaataaag tcctcgcgta cgaagtgcgt atgttgatga ccgacaaact gcaactggag 120

gacggcacgc agttggttgt gcctcccgct ttccgtcggg agatctaccg tgagctgggg 180

atctctctct actccaacga ggctgccgaa gaggcaggtc tgcgttgggc gcaacactat 240

gaattcttaa gccatcagat ggcgcagcaa ctgggcggcc cgacggaagt gcgcgttgag 300

gtcaacaaaa gttcgcctgt cgtctggctg aaaacctggc tgtcgcccaa tatctgggta 360

cgcgtgccgc tgaccgaaat tcatcagggc gatttctctc cgctgttccg ctatacgctg 420

gcgattatgc tattggcgat aggcggggcg tggctgttta ttcgtatcca gaaccgaccg 480

ttggtcgatc tcgaacacgc agccttgcag gttggtaaag ggattattcc gccgccgctg 540

cgtgagtatg gcgcttcgga ggtgcgttcc gttacccgtg cctttaacca tatggcggct 600

ggtgttaagc aactggcgga t 621

<210> 144
<211> 449
<212> DNA
<213> Escherichia coli

<400> 144
accacgacag gtctttatga tctgaaaacc gaaaatacct tgttaactac cgatgctgca 60

ttcgataaat tagggaatgg cgataaagtc accgttggcg gcgtagatta tacttacaac 120

gctaaatctg gtgattttac taccaccaaa tctactgctg gtacgggtgt agacgccgcg 180

gcgcaggcta ctgattcagc taaaaaacgt gatgcgttag ctgccaccct tcatgctgat 240

gtgggtaaat ctgttaatgg ttcttacacc acaaaagatg gtactgtttc tttcgaaacg 300

gattcagcag gtaatatcac catcggtgga agccaggcat acgtagacga tgcaggcaac 360 ttgacgacta acaacgctgg tagcgcagct aaagctgata tgaaagcgct gcttaaagcc 420

gcgagcgaag gtagtgacgg tgcctctct 449

<210> 145
<211> 704
<212> DNA
<213> Escherichia coli

<400> 145
atggaattgc gtctgttcaa ctatctggtc gagcgtaaag atctgattca gatcccggtg 60

tatccgttcg aacgcgaatg gacgcacttc accagcatga cttacattga tgagttttca 120

gagctgcatg gcaaagatgt tccggtgcgt gaagccctcg ccggacaagt gcccagcgca 180

ggcgtcggca cctgtttcag ccgccgcgcc gtgaccgcac tgttagctga cggtgacggt 240

attgctttcg acgtgcagag tcttactgaa gattacgaca ttggcttccg cctgaaagaa 300

aaaggtatga cggaaatttt tgtccgtttt ccggtggtgg acgaagccaa agaacgcgag 360

cagcgtaaat tttacagcca cgcgcggaca tcaaacatga tctgcgtgcg cgaatatttc 420

cccgatacct tttcgactgc ggttcgacaa aaatcccgct ggatcatcgg cattgttttc 480

caaggcttta aaacccataa atggacctcc agcctgacgc tgaactactt tctctggcgc 540

gaccgcaaag ggcaatcag taactttgtc agcttcctcg cgatgctggt gatgatccag 600

cttttgctgt tgctggcgta tgaaagtttg tggcccgatg cctggcattt cctttctatt 660

ttcagcggca gcgcatggtt aatgaccctg ctgtggctaa actt 704

<210> 146
<211> 251
<212> DNA
<213> Escherichia coli

<400> 146
ataatcctcg tcatttgcag attatggaac tcgagggggc gcagctcccg cgcgtactgg 60

atgatcccaa agttgatgta gcgattatca gcaccactta cattcagcag accgggcttt 120

ctccggtgca cgacagcgta tttattgaag ataagaattc gccgtatgtg aatattttgg 180

tggcacggga agataataag aatgcagaaa acgtgaagga atttctgcaa tcttatcaat 240

cacccgaagt c 251

<210> 147
<211> 423

<212> DNA
<213> Escherichia coli

<400> 147
ctctgtccct cagttctacg acggctctgg ccgctgccac gacggttaat ggtgggaccg 60

ttcactttaa aggggaagtt gttaacgccg cttgcgcagt tgatgcaggc tctgttgatc 120

aaaccgttca gttaggacag gttcgtaccg catcgctggc acaggaagga gcaaccagtt 180

ctgctgtcgg ttttaacatt cagctgaatg attgcgatac caatgttgca tctaaagccg 240

ctgttgcctt tttaggtacg gcgattgatg cgggtcatac caacgttctg gctctgcaga 300

gttcagctgc gggtagcgca acaaacgttg gtgtgcagat cctggacaga acgggtgctg 360

cgctgacgct ggatggtgcg acatttagtt cagaaacaac cctgaataac ggaaccaata 420

cca 423

<210> 148
<211> 768
<212> DNA
<213> Escherichia coli

<400> 148
gactcggtac agcgattgcg gcaactggcg caacaaaccg gctcgctgaa gtcatcaacc 60

gaacagaaag ttattaccac aacgaagaaa gctgtaccgg taaaacagac agtcacggca 120

cccgtcatac catccaatac agttttaact gccaaccccg tcattacaga gccggcaaca 180

accgtcattt ccattgagcc cgccaatcct gatgtggtct atattcccaa ctacaaccca 240

accgtggttt acgggaactg ggccaatact gcgtatccgc cggtttatct gccaccacca 300

gccggagaac cgtttgttga cagctttgta cgcggattcg gctatagcat gggcgttgct 360

accacgtacg cactattcag cagcatcgac tgggacgacg acgatcatga ccatcatcat 420

catgacaatg atgattatca tcaccacgat ggcggtcatc gtgacggtaa tggctggcaa 480

cacaacggcg acaacatcaa tatcgacgtc aacaatttca accgtatcac cggtgagcat 540

cttactgata agaatatggc atggcggcac aatccaaact accgtaatgg tgtgccctat 600

catgatcagg atatggcaaa gcggtttcat caaaccgatg tcaacggcgg aatgagcgcc 660

acgcaattac ctgccccaac gcgcgacagc cagcgtcagg cggcagcaaa tcagtttcag 720

caacgaacac acgccgcacc agtcattaca cgagataccc aacgtcag 768

<210> 149
<211> 788

<212> DNA
<213> Escherichia coli

<400> 149
ctttacgacg gttctcccca ggactgaaag cccagtttgc cttcggcatg gtctttttgt 60

tcgttcagcc cgatgccagc gctgctgaca taagtgcgca gcaaataggt ggggtgatta 120

ttccgcaggc cttcagtcag gcgcttcagg acggcatgag cgtcccgctc tatattcatc 180

tcgccggtag ccagggtcgc caggacgatc agcgaatcgg cagcgctttt atctggctgg 240

acgatggaca gctacgcatc cggaaaatac agctggaaga gagtgaagat aacgccagtg 300

tcagcgaaca aactcgacag cagctgatgg ctctggccaa cgccccgttc aatgaggccc 360

ttaccatccc cctgactgac aacgcgcagc tggatctcag cttgcgccaa ctgctgctgc 420

agctagtggt caagcgcgaa gcgctgggca ccgtactacg ctcacgtagc gaagacatcg 480

ggcagtccag tgttaacacc ctcagcagta atctgagcta taacttgggc gtctataaca 540

accagttgcg taacggcggg agcaacacat ccagctatct gtcgctgaat aacgttactg 600

cactgcgcga acatcatgtg gtgctcgacg gctcgctgta cgggatcggt agcggtcaac 660

aggacagtga attatataaa gcgatgtatg aacgcgattt tgccggtcac cgatttgccg 720

gtggaatgct cgacacctgg aacttgcagt ccttagggcc gatgaccgcc atttcagcag 780

ggaagatt 788

<210> 150
<211> 750
<212> DNA
<213> Escherichia coli

<400> 150
ttgaaacttc ttactgccgc atttttagca gcgagtcccg cggcgaagag tgctgttaat 60

aacgcctatg atgcattgat tattgaagct cgcaagggta atactcagcc agctttgtca 120

tggtttgcac taaaatcagc actcagcaat aaccaaattg ctgactggtt acagattgcc 180

ttatgggccg ggcaagataa acaggttatt accgtttaca accgctaccg tcatcagcaa 240

ttaccagcgc gtggttatgc agctgtcgcc gtcgcttatc gtaacctgca acaatggcaa 300

aactcgctta cactgtggca aaaggcgctc tctctggagc cgcaaaataa ggattatcaa 360

cggggacaaa ttttaaccct ggcagatgct ggtcactatg atactgcgct ggttaaactt 420

aagcagctta actctggagc accggacaaa gccaatttac tcgcagaagc ctatatctat 480

aaactggcgg ggcgtcatca ggatgaatta cgggcgatga cagagtcatt acctgaaaat 540 gcatctacgc aacaatatcc cacagaatac gtgcaggcat tacgtaataa tcaacttgct 600

gccgcgattg acgatgccaa tttaacgcca gatattcgcg ctgatattca tgccgaactg 660

gtcagactgt cgtttatgcc tacgcgcagt gaaagtgaac gttatgccat tgccgatcgc 720

gccctcgccc aatacgctgc attagaaatt 750

<210> 151
<211> 733
<212> DNA
<213> Escherichia coli

<400> 151
atagcagggc tgtttgtatc atctctaagt tatgcagaaa acacggagat cccttcttat 60

gaagaaggga tctcgctctt tgatgttgaa gccactctgc aaccagatgg ggtgctcgac 120

atcaaagaaa atattcattt tcaggcgcga aatcagcaga ttaagcacgg cttttatcgt 180

gatttaccac gactatggat gcagcctgat ggggacgctg cactgctgaa ctatcatatt 240

gttggcgtca cccgtgatgg tattcctgaa ccctggcatc ttgactggca tatcgggtta 300

atgagtattg tcgtgggcga taaacaacgt ttcttgcctc aaggcgacta tcattatcaa 360

attcattatc aggttaaaaa tgctttcctg cgtgaggggg attctgatct gctaatctgg 420

aacgtgaccg gtaaccactg gccgtttgaa atttataaga cccgtttttc tctccagttc 480

tctaatattg cgggtaatcc atttagcgaa atcgatcttt ttaccggaga agagggcgac 540

acatatcgta atggccgcat ccttgaggac ggaagaattg aatcccgcga tccgttttat 600

cgtgaagatt tcacggtcct ctaccgctgg cctcacgctt tacttagcaa tgcctcggct 660

ccgcaaacga cgaatatttt cagccatctt cttttaccct ccacgtcatc gttgttaatt 720

tggtttccgt gtc 733

<210> 152
<211> 756
<212> DNA
<213> Escherichia coli

<400> 152
tattgtcatc gcgcagagtc tcacgatgcg ggcgatatca gctttagcga tatctttcgt 60

ggcccggctt ccatctttgg cggcattgag tatcaaacgc cgtggaatcc cctgcgtctg 120

aaactcgaat acgatggaaa caattaccag aatgatttcg ctggcaaact gcctcaggca 180

agccatttca acgtcggcgc agtttatcgc gctgccagct gggcagatct caacctgagt 240 tatgaacgcg gtaacacgtt gatgtttggc ttcacgttac ggaccaattt caacgatctg 300

cgccctgccc tgcgcgatac gccaaaaccg gcatatcaac ctgcgcctga atctgaagga 360

ttgcagtaca ccacggtagc aaaccaactt accgccctga agtataacgc gggctttgac 420

gcgccagaaa ttcagctacg cgataagaca ctgtatatgt ctggtcagca atacaaatac 480

cgtgactctc gtgaagcggt cgatcgtgcc aaccggattc tggtgaataa cctgccgcaa 540

ggcgttgaga agattagcgt gacgcaaaag cgcgagcata tggcgatggt gactaccgaa 600

accgacgtag ccagcctgcg caaacagctg gcaggtacag cgcctggtca atcagagcca 660

ctgcaacaac aacgtgttga agctgaagat ctttctgcct ttggtcgggg ctaccgtatt 720

cgtgaagatc gctttagcta ctctttcaac ccaaca 756

<210> 153
<211> 735
<212> DNA
<213> Escherichia coli

<400> 153
gaataccaaa gcagatcgtc tcgctgaatt aaaaatccgt tcgccctcaa ttcaactgat 60

aaaatttggc gctattggtt tgaatgcaat tatcttttcc cccctgctga tagctgctga 120

tacaggaagt caatatggca ccaatattac tattaatgat ggtgacagaa ttacaggaga 180

taccgccgat ccatcaggaa acctctatgg tgtaatgacc ccagcaggaa acacgcctgg 240

caatatcaac ctgggtaatg atgtcaccgt caatgtcaac gacgcctctg gatatgcaaa 300

aggaatcatt attcagggca aaaacagctc cctgacagct aaccgactca cagtagatgt 360

tgttggtcaa acctctgcca tcggcattaa cttaattggt gactataccc atgctgactt 420

aggcacaggc agcaccatta agagtaacga tgacggcatc attattgggc atagctcaac 480

actaacagcc actcaattca ccattgaaaa ctcgaacggt ataggcctaa ccatcaatga 540

ctatggcacc agtgtcgatc ttggaagcgg aagtaaaatc acgaccgatg gaagtacagg 600

tgtttatatc ggtggtctca acggcaataa cgccaatggt gctgcgcgtt ttacggctac 660

agacctgaca atcgatgttc agggctacag cgccatgggg ataaacgtac agaaaaactc 720

tgttgtcgat ctcgg 735

<210> 154
<211> 509
<212> DNA

<213> Escherichia coli

<400> 154
ctaactcatt gtggtggagc ccaaacatga ttactcatgg tttttatgcc cggacccggc 60

acaagcataa gctaaaaaaa acatttatta tgcttagtgc tggtttagga ttgttttttt 120

atgttaatca gaattcattt gcaaatggtg aaaattattt taaattgggt tcggattcaa 180

aactgttaac tcataatagc tatcagaatc gccttttttta tacgttgaaa acaggtgaaa 240

ctgttgccga tctttctaaa tcgcaagata ttaatttatc gacgatttgg tcgttgaata 300

agcatttata cagttctgaa agcgaaatga tgaaggccga gcctggtcag cagatcattt 360

tgccactcaa aaaacttccc tttgaataca gtgccttacc acttttaggt tcggcacctc 420

ttgttgctgc aggtggtgtc gctggtcata caaataaact gactaaaatg tccccggacg 480

tgaccaaaag caacatgacc gatgacaag 509

<210> 155
<211> 338
<212> DNA
<213> Escherichia coli

<400> 155
ggcgttacta tcctctctat gtgcacacgg agctcctcag tctattacag aactatgttc 60

ggaatatcac aacacacaaa tatatacgat aaatgacaag atactatcat atacggaatc 120

gatggcaggc aaaagagaaa tggttatcat tacatttaag agcggcgcaa catttcaggt 180

cgaagtcccg ggcagtcaac atatagactc ccaaaaaaaa gccattgaaa ggatgaagga 240

cacattaaga atcacatatc tgaccgagac caaaattgat aaattatgtg tatggaataa 300

taaaaccccc aattcaattg cggcaatcag tatggaaa 338

<210> 156
<211> 500
<212> DNA
<213> Escherichia coli

<400> 156
tttgttgtta ttggtacttc attcctgaaa atttctattg tactggggat attgaagaac 60

gcattaggca ttcaacaggt accaccaaac atggcgctaa catcagtgtc tttgatactg 120

acaatgttta ttatgtctcc gataatatta cagataaatg ataatatttc tcaggaacca 180

atcaattata ccgactctga tttttttcaa aaagttgatg agaaaatatt atcaccatat 240

cgcggtattt tagaaaaaaa tacagagaaa gacaatgtag agtttttga acgtgcagct 300 caaaaaaaat tgggtaatga aactatctta aaaaaagact ctctatttat actgttaccg 360

gctttcacga tggggcagct tgaagctgca ttcaagatag gttttttgct ctatttaccc 420

tttattgcga tagatttgat catttccaat atcttattgg ccttgggtat gatgatggta 480

tcgccagtaa caatttcgat 500

<210> 157
<211> 503
<212> DNA
<213> Escherichia coli

<400> 157
ttacgcttcc gatcatagta gagaactata cattttcgga aaaattgcca tctggaatct 60

ttcagttgac aggaatagtg ctaaaagaaa taagtattgg ttttttcatt gggttatcat 120

ttactattct tttttgggca atagatgcgg ctgggcagat tattgatact ctaagaggtt 180

caacaatatc ttcaattttt aacccgtcca taagtgattc atcttctatc actggcgtta 240

ttttgtacca atttatctct gtgatctttg ttattcatgg tgggatacaa agcattctgg 300

ataagctata tttatcctac gagatattac cattacaagc cgatattgca ttcaatcgtg 360

ctttaataga ttttttgttt tctctatggg attcatttat taaactgatg ttatcatttt 420

cagttcccat gattatcggt atattcttat gtgatatggg gtttgggttt cttaacaaaa 480

cagcgcctca actaaacgta ttc 503

<210> 158
<211> 617
<212> DNA
<213> Escherichia coli

<400> 158
aagtgaagag gtaatggctg cagtgcagtc attaatctta ttttcatttt tttctttata 60

tggcatgagt ttttttgttg atatagttgg gttagttaat acgacaatag actcgctaaa 120

tagaccgttt ttgtatgcca ttcgagaaat attaggtgcg gtgttaaata tatttttatt 180

atatattttg ccaatttctt tgattgtctt tgttggaact gttacgactg gtgtatcaca 240

aataggattc atctttgcgg ttgaaaaaat aaaaccatcg gctcagaaga ttagtgtaaa 300

aaataacctg aaaaatattt tttctgtaaa gagcattttt gagctactta aatcagtatt 360

taagttagtg ataattgttc tcatttttta ttttatgggg cattcatatg caaatgagtt 420

tgctaatttc acaggactga acgcatatca agctcttgtc gttgttgcct tttttgtttt 480 tcttttatgg aaaggcgtgc tattcggata tctactcttt tcagtatttg atttctggtt 540

ccagaagcat gagggactga agaaaatgaa aatgagtaaa gatgaggtga aacgagaagc 600

caaggatact gatggta 617

<210> 159
<211> 740
<212> DNA
<213> Escherichia coli

<400> 159
gatggtgact ctattgcagg attaccaaca aaaacaattg gcgcaaagct atcagattca 60

gcaggccgtt tttgagagcc agaataaagc tattgaggaa aaaaaagccg cggcaaccgc 120

tgctttggtt ggcgggatta tttcatcagc attggggatc ttaggttctt ttgcagcaat 180

gaacaacgcg gctaaagggg ctggtgagat tgctgaaaaa gcaagctctg catcttcaaa 240

ggctgctggt gcggcttctg aggttgcaaa taaagctctg gtcaaggcta cggaaagtgt 300

tgctgatgtc gcagaggagg catccagtgc gatgcagaaa gcgatggcca caacaacgaa 360

agcagccagc cgtgcatctg gcgttgcaga tgatgttgcg aaagccactg actttgctga 420

agatcttgca gacgccgccg agaagacaag cagaatcaat aagttgttga attccgtaga 480

taaactgacc aataccacag catttgttgc cgtgaccagt cttgctgaag gtacgaaaac 540

gttgccaaca acaatatctg agtccgtcaa atcgactcat gaggttaatg aacaacgtgc 600

gaagtcgctg gaaaacttcc agcaggggaa tctggagctg tataaacaag acgttcgcag 660

aacgcaggat gatatcacga ctcgtctgcg tgatataacg tccgctgtcc gcgatctcct 720

tgaggtccag aatcgtatgg 740

<210> 160
<211> 717
<212> DNA
<213> Escherichia coli

<400> 160
tgtttgaggt cactttctgg tggcgtgatc cccaaggttc tgaagaatac tcgacgataa 60

agcgcgtatg ggtctacatc actggtgtga ccgatcacca tcagaacagc cagccccagt 120

cgatgcagcg aattgcaggc actaacgtct ggcagtggac gacacaactc aatgccaact 180

ggcgcggcag ctactgcttt attcccaccg aacgcgatga catttttct gtaccatccc 240

ccgatcgcct cgaattgcgc gaaggctggc gaaaactatt accccaggcg atagccgatc 300 cgctgaacct acaaagctgg aaaggcgggc gagggcacgc tgtttctgca ctcgaaatgc 360

cgcaagcgcc tctgcaaccg ggatgggatt gtccgcaagc gccagaaata cctgccaaag 420

aaattatctg gaaaagtgaa cggttgaaaa agtcacggcg tgtatggatt tttaccaccg 480

gcgatgcaac agcagaagaa cgcccgctgg cagttttgct cgatggcgaa ttttgggcgc 540

aaagtatgcc cgtctggcca gtgctgactt cgctgaccca tcgtcagcaa cttcctcccg 600

ccgtgtatgt gttgatcgac gctatcgaca ccacgcaccg cgcccacgaa ctgccgtgta 660

atgcggattt ctggctcgca gtacagcaag agttattacc cctggtgaaa gctattg 717

<210> 161
<211> 379
<212> DNA
<213> Escherichia coli

<400> 161
tgtttctgca ctcgaaatgc cgcaagcgcc tctgcaaccg ggatgggatt gtccgcaagc 60

gccagaaata cctgccaaag aaattatctg gaaaagtgaa cggttgaaaa agtcacggcg 120

tgtatggatt tttaccaccg gcgatgcaac agcagaagaa cgcccgctgg cagttttgct 180

cgatggcgaa ttttgggcgc aaagtatgcc cgtctggcca gtgctgactt cgctgaccca 240

tcgtcagcaa cttcctcccg ccgtgtatgt gttgatcgac gctatcgaca ccacgcaccg 300

cgcccacgaa ctgccgtgta atgcggattt ctggctcgca gtacagcaag agttattacc 360

cctggtgaaa gctattgcc 379

<210> 162
<211> 402
<212> DNA
<213> Escherichia coli

<400> 162
tatgctgctc caactattcc tcaggggcag ggtaaagtaa cttttaacgg aactgttgtt 60

actgctccat gcggcatttc tcagaaatca gctgatcagt ctattgattt tgggcagctt 120

tcaaaaagct tccttgcggc aggaggtgta tccaaaccaa tgaatttaga tattgaattg 180

gttaattgtg atatcacttc atttaagggg gggggaggaa gccaggcagc aaaaaaaggg 240

actgtgaagc tggcttttag tggtccaagg gtttctggtc ataatgagga gttagatacc 300

agcgggggga caggtactgc aattgcagtt caggccgcag gtaaaaacgt ttctttcgat 360

ggcacagaag gtgatgctaa taccctgaaa gatggagata at 402

<210> 163
<211> 724
<212> DNA
<213> Escherichia coli

<400> 163
cttggaaatg ttggtaaagc tgtttcgcaa tatattctgg ctcagagaat ggcacagggg 60

ttatcgacaa cagctgcaag tgcgggtctg atcacatcgg ctgttatgct ggctatcagt 120

cctctttctt tcctggctgc tgcagataaa tttgagcgag ctaagcagct tgaatcatat 180

tctgaacgat ttaaaaaatt gaattatgaa ggggatgctt tactcgcagc ctttcataaa 240

gaaaccggag ctatagatgc agccctgaca acaataaata ctgtcctgag ttctgtatct 300

gcgggagtta gtgcagcctc cagtgcatcc ctcatagggg ccccgataag catgctggtg 360

agtgcattaa ccggtacgat atctggcatt ctggaagcat caaaacaggc tatgtttgag 420

cacgttgcag agaaattcgc tgctcggatc aatgaatggg aaaaggagca tggcaaaaat 480

tattttgaga atggatatga cgcaagacat gctgcgtttt tagaagactc tctgtctttg 540

cttgctgatt tttctcgtca gcatgcagta gaaagagcag tcgcaataac ccagcaacat 600

tgggatgaga agatcggtga acttgcaggc ataacccgta atgctgatcg cagtcagagt 660

ggtaaggcat atattaatta tctggaaaat ggagggcttt tagaggctca accgaaggag 720

ttta 724

<210> 164
<211> 618
<212> DNA
<213> Escherichia coli

<400> 164
tcaatgctga aactataagg catcagtata atacccacac acaagatttt ggggtgactg 60

aatggttact ggcagcgaaa tctattggct taaaagcaaa atatgtagaa aaacattttt 120

ccagattgtc aataatttct ttacctgcgt tgatatggcg ggatgacggt aagcattata 180

tattgtctcg tattactaaa gattcatcac gctatcttgt ttatgatcca gaacaacatc 240

agtcactaac ttttagtcgg gatgagtttg aaaaactgta tcagggaaaa gtcattctgg 300

ttacgtcaag agcaacagta gtcggagagt tagctaaatt tgatttttct tggtttatcc 360

cctctgttgt gaaatacagg aggattttac ttgaggtgtt aactgtttct gcttttattc 420

agtttcttgc gttaataaca cctctttttt ttcaggttgt aatggataag gttttagttc 480 accgggggtt ttcaacgtta aatattatca caatagcatt tattatagtg atactttttg 540

aagtgatatt aaccggagcc agaacttata ttttctctca tactacaagt cgtattgacg 600

tcgaactggg tgctaagt 618

<210> 165
<211> 768
<212> DNA
<213> Escherichia coli

<400> 165
catcaggcag ttatcctgtc gactttacca ctctctcccg gcttattatt gataagctcc 60

ggcatcaact ttttctgcca gttcccctct gcgaaacttt ccaccaacgc gtgctggaaa 120

gctacgccca tacgcaacag acaattgatg cccgccatga ctgggccatc ctgcgtgaaa 180

aagcgttgaa ttttggcgag gctgagcagg cactgctgac aggacacgct ttccaccctg 240

cacctaagtc tcatgaaccg tttaaccgcc aggaagctga acgatacctg cctgacatgg 300

cacctcactt cccgctgcgg tggttttcgg tggataaaac gcaaatcgct ggtgaaagtc 360

tgcatcttaa ccttcaacag cggttgacgc gatttgccgc agaaaatgcg ccccagttac 420

tcaacgaatt aagtgacaat caatggctgt tcccgctgcg cccgtggcag ggagaatatc 480

ttttccagca agtgtggtgc caggcacttt ttgctaaagg acttatcaga gacttaggcg 540

aggccggcac gtcgtggctg ccgaccacct cttcccgctc cctctactgt gctaccagcc 600

gcgatatgat caagttctcc ctgagcgttc ggctgaccaa ctccgtccgt actctgtctg 660

tgaaagaggt ggagcgagga atgcgcctgg cacgtctggc gcaaaccgac ggctggcaga 720

tgctacaggc ccgcttccct actttccggg taatgcagga ggacgact 768

<210> 166
<211> 501
<212> DNA
<213> Escherichia coli

<400> 166
ttcacagcgg atatggactg cgctgtgaaa aactcgacaa gcctctgaat cttggctggg 60

ggctggacaa tagcgcggtg ttgcactggc ccggggagct gccaacaggg tggctgtgcg 120

acgcgctgga tcagatattt atcgccgcac cacaactttc agcagtggtt cttccctggt 180

ccgaatggtg tgaggagcca caggcgctga cgcttttcgg acaggtacaa agcgacatta 240

tccatcgttc cgctttctgg cagttaccgt tatggctgag ttctccggca aaccgggcct 300 ccggtgaaat ggtttttgat gcagagcgtg agatttattt cccgcagcgc cccccccgtc 360

cgcagggtga agtttatcgt cgttacgatc cacgcattcg caggatgctg agtttccgca 420

ttgccgatcc cgtttctgat gcagaacgtt tcactcgctg gatgaacgat ccgcgcgttg 480

agtatttctg ggagcaaagt g 501

<210> 167
<211> 721
<212> DNA
<213> Escherichia coli

<400> 167
agactgggat ttggtcaacc gccgcctggt ggcaaaaatg ttgtctgagc tggagtatga 60

gcaggttttc cacgcggaat ctcagggcga tgaccgctac tgcattaacc tgccgggagc 120

acaatggcgc ttcatcgctg aacgtggtat ctggggctgg ctctggattg atgctcaaac 180

tctgcgctgc gcggacgagc cagtactggc tcagacgctg ctgatgcagc taaagcaggt 240

actgtcaatg agcgatgcaa ccgttgctga gcatatgcag gatttgtatg ccacgctgct 300

gggcgacctg caactactga aagcccgtcg cgggctgagc gccagtgacc tgattaatct 360

taatgccgac cgcctgcaat gcctgctgag cggtcatcct aaattcgttt ttaataaagg 420

tcgccgtggc tggggtaaag aggcgctgga acgatatgcg ccagagtatg ccaacacctt 480

cagactgcac tggctggcgg taaaacgtga acatatgatc tggcgctgtg ataacgagat 540

ggatattcat cagttgttga cggccgcaat ggatccgcag gagtttgccc gcttcagtca 600

ggtctggcag gaaaacggac tggatcataa ctggctgccg ctgccggtac atccgtggca 660

gtggcaggaa aaaatcgcta ccgacttcat cgctgatttt ggcgaaggca ggatggtgtc 720

t 721

<210> 168
<211> 719
<212> DNA
<213> Escherichia coli

<400> 168
ggagtatatt gcgtgggtag tattccccaa aaaggttatg accaaaaatg gatatccctt 60

atttattgag gttcataata aaggtagctg gagtgaggag aatactggtg acaatgacag 120

ctattttttt ctcaaggggt ataagtggga tgagcgggcc tttgatgcag gtaatttgtg 180

tcagaaacca ggagaaacaa cccgtctgac tgagaaattt gacgatatta tttttaaagt 240 cgccctacct gcagatcttc ctttagggga ttattctgtt acaattccat acacttccgg 300

catgcagcgt catttcgcga gttacttggg ggcccgtttt aaaatcccat acaatgtggc 360

caaaactctc ccaagagaga atgaaatgtt attcttattt aagaatatcg gcggatgccg 420

tccttctgca cagtctctgg aaataaagca tggtgatctg tctattaata gcgctaataa 480

tcattatgcg gctcagactc tttctgtgtc ttgcgatgtg cctgcaaata ttcgttttat 540

gctgttaaga aatacaactc cgacatacag ccatggtaag aaattttcgg ttggtctggg 600

gcatggctgg gactccattg tttcggttaa cggggtggac acaggagaga caacgatgag 660

atggtacaaa gcaggtacac aaaacctgac catcggcagt cgcctctatg gtgaatctt 719

<210> 169
<211> 561
<212> DNA
<213> Escherichia coli

<400> 169
aaatgaatgt ctggactcaa cgtggatttc atcaaaagga aactatattc agaagtttga 60

aaataaattt gcggaacaaa accatgtgca atatgcaact actgtaagta atggaacggt 120

tgctcttcat ttagctttgt tagcgttagg tatatcggaa ggagatgaag ttattgttcc 180

aacactgaca tatatagcat cagttaatgc tataaaatac acaggagcca cccccatttt 240

cgttgattca gataatgaaa cttggcaaat gtctgttagt gacatagaac aaaaaatcac 300

taataaaact aaagctatta tgtgtgtcca tttatacgga catccatgtg atatggaaca 360

aattgtagaa ctggccaaaa gtagaaattt gtttgtaatt gaagattgcg ctgaagcctt 420

tggttctaaa tataaaggta aatatgtggg aacatttgga gatatttcta cttttagctt 480

ttttggaaat aaaactatta ctacaggtga aggtggaatg gttgtcacga atgacaaaac 540

actttatgac cgttgtttac a 561

<210> 170
<211> 750
<212> DNA
<213> Escherichia coli

<400> 170
agcagcatca ggttctgagc tgcattgcga atcaaatgac aacggaagat attctggaga 60

aactgaaaat atcgctaaaa acgctctact gccataaaca caatatcatg atgatcctca 120

atcttaagcg gatcaatgag ctggtacgcc atcagcatat taattatctg gtgtgaacga 180

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ttgaacaata taaagaggcc cagcaacagc cagacctccc gttaattata cgttatgcag    240

taacgccttc cggtatcaac gaagcaattt gcttacgcca ttgcgcttgc tcctgttcac    300

cttctgtacg ttgaccataa agttgcgcta tctgcgtacc atcatgggca aacaattcca    360

gactggttac gtgaccatcg ctggtcggtt tacgggtaac ccaggcttca gcaatgctct    420

cttctaatag atgaagggta aacgtcgggt tgaaaatatt cagccaacct ttcattggca    480

ccactttttc taccacaccg gtgaaaatct gtacgcagcc acggttgcca acaaacacca    540

tgatttcatt gccatcctgc tgtgcagatt caagaatttg cgccaacgca ctgttggata    600

ctttgcaggc caaatcgtct gccaccagat tgaacgcctg ttggcgcgtc aggttgtggc    660

gcttgagcaa cgtaaaaaac tgatgaacgt cggtcatcgc ccgccactct tgctcgacca    720

cactggcatc ggctcgcgtt tgaacaactg                                     750
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<210> 171
<211> 616
<212> DNA
<213> Escherichia coli

<400> 171

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ttcttcggta tcctattccc gggagtttat gatagacttt tcgacccaac aaagttatgt     60

ctcttcgtta aatagtatac ggacagagat atcgacccct cttgaacata tatctcaggg    120

gaccacatcg gtgtctgtta ttaaccacac cccaccgggc agttattttg ctgtggatat    180

acgagggctt gatgtctatc aggcgcgttt tgaccatctt cgtctgatta ttgagcaaaa    240

taatttatat gtggctgggt tcgttaatac ggcaacaaat actttctacc gtttttcaga    300

ttttacacat atatcagtgc ccggtgtgac aacggtttcc atgacaacgg acagcagtta    360

taccactctg caacgtgtcg cagcgctgga acgttccgga atgcaaatca gtcgtcactc    420

actggtttca tcatatctgg cgttaatgga gttcagtggt aatacaatga ccagagatgc    480

atccagagca gttctgcgtt ttgtcactgt cacagcagaa gccttacgct tcaggcagat    540

acagggagaa tttcgtcagg cactgtctga aactgctcct gtgtatacga tgacaccgga    600

agaagtggac ctcaca                                                    616
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<210> 172
<211> 613
<212> DNA
<213> Escherichia coli

<400> 172
aaatggcgac aaattatacc gtgctgactc tagaccccca gatgaaataa aacgttccgg 60

aggtcttatg cccagagggc ataatgagta cttcgataga ggaactcaaa tgaatattaa 120

tctttatgat cacgcgagag gaacacaaac cggctttgtc agatatgatg acggatatgt 180

ttccacttct cttagtttga gaagtgctca cttagcagga cagtctatat tatcaggata 240

ttccacttac tatatatatg ttatagcgac agcaccaaat atgtttaatg ttaatgatgt 300

attaggcgta tacagccctc acccatatga acaggaggtt tctgcgttag gtggaatacc 360

atattctcag atatatggat ggtatcgtgt taattttggt gtgattgatg aacgattaca 420

tcgtaacagg gaatatagag accggtatta cagaaatctg aatatagctc cggcagagga 480

tggttacaga ttagcaggtt tcccaccgga tcaccaagct tggagagaag aaccctggat 540

tcatcatgca ccacaaggtt gtggagattc atcaagaaca attacaggtg atacttgtaa 600

tgaggagacc cag 613

<210> 173
<211> 227
<212> DNA
<213> Escherichia coli

<400> 173
aagaagatgt ttatggcggt tttatttgca ttagtttctg ttaatgcaat ggcggcggat 60

tgcgctaaag gtaaaattga gttttccaag tataatgaga atgatacatt cacagtaaaa 120

gtggccggaa aagagtactg gaccagtcgc tggaatctgc aaccgttact gcaaagtgct 180

cagttgacag gaatgactgt cacaatcaaa tccagtacct gtgaatc 227

<210> 174
<211> 260
<212> DNA
<213> Staphylococcus epidermidis

<400> 174
ccactttttc tacttctaaa acttcagcaa gtgtttcacg taacttgcta gaacgagtaa 60

tttttatatc gtccttacca tcattttgtt ctatggtaaa tatattcata ttattttctt 120

ctttaaatat tgctgcatgt actgtaaact tatcgtagtc aatcatagtt agtactgtat 180

ctaggtgcat aaatgtgcgt gtattaggta tttcaatagc tacgattttt ttaaaacttg 240

tgtttgcatc tttgaaaata 260

<210> 175
<211> 422
<212> DNA
<213> Staphylococcus epidermidis

<400> 175
ttgataacaa acaaattctg ctatttcatt tgaagaagtc aaaatcatca aagtatcgtt 60

acctccaata gttcctaata tttctttcat ttgtaattga tctatgtaat aacttatact 120

ttgagcaaag ccaggagatg tttttattaa gacatagtta tttagcgtta taaattcaat 180

aatctcatca ctaaatattt ctaattgttt ttttgcactt aattgatttg tttgatttat 240

tttcttgtaa atatactttt tattttcaac agggattttg taaatttcta attcttgtaa 300

gtcacgagaa atagttgtca agctatagta aactccaaaa tgtcttgcca tgtaatccac 360

tatttgttgt tttttattaa actgattctg ttgtataaca gttaagataa gatttaaacg 420

tt 422

<210> 176
<211> 322
<212> DNA
<213> Staphylococcus epidermidis

<400> 176
taacactgaa ccccaatgac ctacaatatg ttctaatact tgtgccattg atggattagc 60

aagttttgaa atttggttct gctgaatgac accttgggct agtacagtca ttaagaaata 120

aatgactagc acagaaatca aaccaataac ggtagcagtt cctacatcct ttttagactt 180

tgcacgtcca gaaaagacaa cggctccttc aatccctgtg aatacccata cagttactaa 240

catagtactt tttacttgtg ccattgtatc tccccaacta aaaacgccaa cacttccact 300

agtcatacca taaaaaccgg at 322

<210> 177
<211> 733
<212> DNA
<213> Staphylococcus epidermidis

<400> 177
cctcaaacaa gcagaaaaag ctaaaagcga agttacacaa tcaactacaa atgtatctgg 60

tacacaaaca tatcaagacc ctacccaagt tcaacctaaa caagacacac aaagtactac 120

atatgatgca tcattagatg aaatgagtac ttataatgaa atttcatcaa atcaaaagca 180

acaatcttta tcaacagatg atgcgaatca aaatcaaacg aattctgtta caaaaaatca 240 acaagaagaa acaaatgatt tgacacaaga agataaaaca tccactgata caaatcaatt 300

acaggagaca caatctgtag caaaagaaaa tgagaaagat ttaggagcta acgcaaataa 360

tgaacaacaa gacaagaaga tgactgcaag tcaaccttcc gaaaatcaag caattgaaac 420

tcaaactgct tctaatgata atgaaagcca acaaaaaagt cagcaagtaa cttctgaaca 480

aaatgaaact gctacaccta aagtatcaaa tacaaacgca tctggttata attttgatta 540

cgatgatgaa gacgatgata gctcaacaga ccatttagag cctatctcat taaacaatgt 600

gaatgctaca tctaaacaaa ctacttcata taaatataaa gaaccagctc aacgtgtaac 660

aactaatact gtaaaaaaag aaacggcatc taatcaagcg actatagata caaagcaatt 720

cacccccattt agt 733

<210> 178
<211> 507
<212> DNA
<213> Staphylococcus epidermidis

<400> 178
cttagggaaa aagatgggta gtaatgttaa agattctaaa attacaccga ataaaataag 60

tttatttacc ggttctttag ttactaatga aataactacg atagtacaat ataaaaatat 120

ggagagtatt ttttttcgct ttacaagacg tctaggtata ggttgtttct tagttgctgc 180

aggtgcgtat aaaatggtaa taattaatcc gactaatgcc atagataaaa gaacaaaata 240

gttaatatct aactttatta ttaagtatgg aaagataata aagaaaatta tgttctgaat 300

atgacataac aatgacgaat ttgcatgcgt accgtgtgca tgtctcctaa ttaaaaaata 360

acttaaatga gttaaaagtg tgtaaaagaa agtatgaaag attattgcta gcccatacac 420

aactatagac ttttcaatat ttatcgctag tacctgcatc cctaaacgaa tttttagaaa 480

ctgtatgtga tctaagttat ttttacg 507

<210> 179
<211> 512
<212> DNA
<213> Staphylococcus epidermidis

<400> 179
cctcgcatat cagtttgtga caccatataa agtaaaataa atgatatgaa aagtactatt 60

gttattatca ataagtatct tttattgagt gacaagtagg atacttttaa tttattgaac 120

aatagttgag ttaaataagc aataattaga gttatgatta caaaagaggt aaaatgtatt 180 aactgtaaag caaatttaaa cggaatataa tcttttatag tcaaatgtat gtatacagtt 240

atgaaattag ttatatataa gatcatagtg gtgaataata caactaatat tgaataaagc 300

tttatttttg tataaaagaa aatggtgatt attataacca aaactattaa tgctttactt 360

tgccaaaagt aatacattat tgcagaaggg attacaatcg taaaaacgat tatgtaatcc 420

ctaaaattaa atttcatatt aatgataact ttagtaaccc aaatcattaa aaagatttgt 480

aggcctgcaa acggaaatag attaatatca tc 512

<210> 180
<211> 534
<212> DNA
<213> Staphylococcus epidermidis

<400> 180
atgaagcaca accaccatac cttgtaaatt ttttttagat ttagttaaaa tggggataca 60

agatacatcg aaatatttag tatgtacgtt attaatagca acttctaatt gttcatagat 120

aactttttca gttctaaaac tttcaataat taatttttca atactatcat ctatgaaacc 180

aatgtaactt ttattttcta ccatttgatc agggttaaac acctgataat aagcatgatt 240

agcaactaca atttctccat gtttatcaat catcagtact gaactcggta tattttctaa 300

ggtagttttt aatctattgg attgaatttt ttgactattg tttaattttt gcaatcgtcg 360

tgctaagtca tttgtagtca caaataatgc cctagtttcc ttcacattac tttctggaac 420

acgaacatgg taatatccat ctgctagaag tgatgtagca taagttactt cattgatagg 480

tctaatatat gttcgattga tacttctact tgctaaatag accgtaaata atac 534

<210> 181
<211> 286
<212> DNA
<213> Staphylococcus epidermidis

<400> 181
ctaagcacaa gaaaggctca atattagcta tcataggttt gctaattgta tttgttgtta 60

caggttttat cttcttttca atgatttcag atcaaatatt tttcaaacat gtcaaaccag 120

ttgaaaaggt tgaaaaatta gataaaactt tagataaagc atctaaaaag caaatacaca 180

attatacgag ccaacaagta tctaacaaag caaatacagc ttggcgtgat gcgtctggta 240

cagaaattaa agaagctatg gatagtagta aattcataga tgatga 286

<210> 182

<211> 381
<212> DNA
<213> Staphylococcus epidermidis

<400> 182
acgacgaatg attcataagg tttaatatgg tctaaattta tatcatttaa gtgataatta 60

tgcaatttta tatctacaga tgaaatatct aattcaaaag gtaggtttag ttctgatact 120

tcatttgtga gattggctac aattaataca gtattgtttt taaatgtgcg tgtatatgca 180

aaaacctgct tattttcagc atcgaccata ttaaacttac cgtagatgta aatcaaatca 240

gattttttta gttgaattaa cgctttataa taagaaagta tcgaaaactt atcatttagt 300

tgttgtttaa cattaatttc tgtatagtta gggtttacat gaaaccatgg cttaccagta 360

gtgaatccag cattgataga a 381

<210> 183
<211> 272
<212> DNA
<213> Staphylococcus epidermidis

<400> 183
ttaaaccatt aggaaatcgt gtgattattg agaagaaaga gcaagaacaa gcagctaaaa 60

gtggcatcgt tttaacagat agcgctaaag aaaaatcaaa tgaaggtgtg atcattgcag 120

ttggacaagg tcgtttatta gacaatggca cacaagttgc tcctcaagtc agtgaaggtg 180

acacaatcgt cttccaacaa tatgcaggta ctgaagtaaa acgtggcgcc caaacatatt 240

taattttaaa tgaagaagat atattagcta tt 272

<210> 184
<211> 614
<212> DNA
<213> Staphylococcus epidermidis

<400> 184
tcaagacacg ctttctagtg ttttatctct agaatatcct gaaaaagaaa ttatcattat 60

caatgatgga agttctgata atactgctga aatcatctat gaattcaaga aaaatcatga 120

ttttaaattt gttgacctcg aagtcaatag aggtaaagct aatgcactca atgagggaat 180

caaacaagca tcttacgaat atgttatgtg cttagatgct gacactgtca ttgatgacga 240

tgcgcctttt tatatgattg aagactttaa aaagaatcca aaattaggcg cagttacagg 300

taatccacgt attcgtaata aaagttctat cttaggaaaa atacagacca ttgaatatgc 360

aagtattatt ggttgtatca agcgaagtca atctctagca ggagcaatca atactatttc 420 aggtgttttc acactattta aaaaaagtgc actcaaagat gtaggttatt gggatactga 480

catgattact gaggatatcg ctgtttcatg gaaactccat ctttttgatt acgaaattaa 540

gtacgaacca cgcgcacttt gctggatgtt ggtgcctgaa actataggtg gtttatggaa 600

acaaagggtt cgat 614

<210> 185
<211> 329
<212> DNA
<213> Staphylococcus epidermidis

<400> 185
gttttcttat tacgaaccac attggttcta ccaattttca taatttaaat ttactttcaa 60

aaaagcaatt agatgaaatg tatgaaacag gcttatggga ctttgaatct catactcatg 120

atttacacgc tcttaagaaa ggcaataaat cgaagttttt agattcgtct caatctgttg 180

ctagtaaaga tattaaaaaa agcgaacact atttaaataa aaactaccca aaaaatgaac 240

gcgcacttgc ttacccatac ggattaatta atgacgacaa aataaaagct atgaaaaaaa 300

atggaattca atatgggttt acacttcag 329

<210> 186
<211> 220
<212> DNA
<213> Staphylococcus epidermidis

<400> 186
ttattctgct atatgatatt cacgaatatt gttatcaata gattttaaat agaaaatgtc 60

acgatctgca tttgattttt caagttcatg attcaattct aattggtcaa agcgtttgaa 120

gaaatgttca tattcatcaa cagaaacctc tattctatta tttaataaag atttgtggcg 180

ctcaacatct aattgctcct tgaatccatc tactaatgtt 220

<210> 187
<211> 210
<212> DNA
<213> Staphylococcus epidermidis

<400> 187
acattaagtc agcatttgga gaaaacatga ataaatgtct aaaccatatc gcaatggttt 60

gacgataatc aaattcaggt tgaatcgcat tggttacaag cgtagaataa caacccatta 120

ttaaaataat caacaaaacg atattcacaa atatatctga aatgaactt aatcgtctaa 180 cgtttttgat ggatagtcgt cttaaagtta 210

<210> 188
<211> 200
<212> DNA
<213> Staphylococcus epidermidis

<400> 188
attagagcca aagtactctc caccgtaacc ttgacttcct tgcgctttat aagtatctaa 60

atatgtttct ttatgggaag aaggcacaac aaaacgatct tcatatttag caatacctag 120

taagcgatac atttcagtca tctgtctttc agtaagtcct aatcgttcta atttagaagt 180

atcgaaaggt tggtttgtta 200

<210> 189
<211> 284
<212> DNA
<213> Staphylococcus epidermidis

<400> 189
tttgatacct gtaatttgtt cttgccaagc gggagtatat ttagaagatg cgtcatcata 60

agatgtagct tctagttcgt gttcaaaacg ttgaacacca tattgactcg tcattaaatc 120

ataaaccgta gcaattttaa cttcttctcc gttagctaac tgaatagttc tcgttgcaat 180

aggtctctca aagataccat caccactgct atcaaaatat ggaaattgaa tcgtttcaac 240

atgatagtca ctttcaacca ttgataacat tggatcaatt ggtg 284

<210> 190
<211> 721
<212> DNA
<213> Staphylococcus epidermidis

<400> 190
agcttctcgc actacttgac taggatcatt agtgacctct attcctacca ttaaacctac 60

accacgtact tcaattacat ttcttttatt tactaaactt tttcttaagt tttcaataag 120

aaattgcccc tttgattgaa catcattcag caaatcagca tcattaatga tagaaagcgt 180

ttggtttgca gcagccaatg ataatctatt tccaccgaat gttgtaccat gagaaccgta 240

gccaaatgca tgacctaaat tctttttgcc taacattgct ccaataggaa ggccattacc 300

taatccttta gctaatgtga tgatatctgg agacaattga taatgttcat gagcatataa 360

cttaccggtt ctacctatgc ccgtttgaac ctcgtctaca attataagga tatctttttg 420

tttacaatac tcatttaatt gcttcataaa taaaggatca gcaggtagta ctcctgattc 480 accttgaatt atttctataa ttacagcagc agtattattt gaagttaatg atttaaatga 540

attaaaatca ttaaaaatag caaatttgaa tccaggaaca accggaccaa attgatctgt 600

aattttcttc tgtcctgttg cagacattgc gccgtacgtt ctgccgtgaa aagacttttt 660

aaaagcaata atttccgact taccagtagc tttacgtgcg agtttgatag ctgcctcatt 720

c 721

<210> 191
<211> 465
<212> DNA
<213> Staphylococcus epidermidis

<400> 191
aaagaaatta agtctctagc caaaatgtat cttggtggta gtactgaaat taaaacatca 60

caacttaaag gtaaggatga ctacttaaat gatatatact attaccaccc aagcgtaaaa 120

agtattatgg aatattcaaa tcttttacgt aatgatttag atttatctca aataacaaac 180

aaaaacgatt tcttagatca aagagtcatt aaacgatatg gttcactcgt acccttaaca 240

gaattagatg aagacttatt gcgtaagaac caaaaggaat cgactgatag tcagaaagag 300

tctgattctt catcacaaaa taatgatgaa gaagatcaaa ctaacgaaca aacagaccaa 360

aatagcttaa acggaaacga acagtaccca aatcaacaag acaacaatca aaccaatggt 420

gaaaatggta tgataaataa tgacaattat ccttacgcac aataa 465

<210> 192
<211> 362
<212> DNA
<213> Staphylococcus epidermidis

<400> 192
aaccaaacga tgctagatga ttgctttgaa ataagaaagt gtgttttcgt cgaagaacaa 60

ggcgtaccac tcgaaaatga atttgatcaa tatgaagatt actcattcca tatagtggga 120

tatataaatg gtgttcctat ggcaactgct agaattagac ctttaaatac tcatatttgt 180

aaaattgaac gtgtagcaat catcaagtgg tatcgtggtc ttgggtacgg taaaaattta 240

atacatgcta ttgaaacaat tgcaaaaaaa caccaataca atgaactcac tatgaatgct 300

caattacaag ctcgagactt ttacttaaaa ctaggttact caccttttgg taaagtattc 360

tt 362

<210> 193
<211> 320
<212> DNA
<213> Staphylococcus epidermidis

<400> 193
agttttataa tattcagtgc aaaattcaat tattgcgttt tgaagtggat aatagtattc 60

ggttgttaaa gatagttcat tatataaata aaatttttct ctattagttt tacatttgat 120

ttgttccttt ttccactgtt cttgccattt agattcttct atatttaaaa tttctaaaaa 180

tagattttct tttgttttaa agtgataata aagattccct ttactacttt ctgataattt 240

aacaatttct ccagtagtag tggcattata tccatttttt ataaataatt cctttgcgac 300

acctagtatt ttatctttca 320

<210> 194
<211> 503
<212> DNA
<213> Staphylococcus epidermidis

<400> 194
tttagagaga cagctagata atttgaaaac atttggcgta gagaaaatat ttacagagaa 60

acgatcgggg aaatcagtag aaaatagacc tgtatttcaa gaagcactta actttgtgag 120

aatgggcgat agatttgtgg tagaatcgat tgatcgctta ggtcgtaatt atgatgaagt 180

gattaacaca gttaattatt taaaagataa agaggttcaa ttgatgatta ctagcttacc 240

tatgatgaat gaagtcattg gcaatccatt attagataaa tttatgaaag acctaatcat 300

tcaaatatta gcaatggttt cagaacaaga acgaaatgaa agtaaacgta gacaagcaca 360

aggtattaaa gttgcgaaag aaaatggtgt atataaagga cgccctctat tgtactcacc 420

taatgctaaa gatcctcaaa aacgcattat ttatcataga gttgtagaaa tgttagaaga 480

aggtcaagca attagtaaga ttg 503

<210> 195
<211> 320
<212> DNA
<213> Staphylococcus epidermidis

<400> 195
tgaaagaagg gatagttttg cactttacac aacgtgaaca agacaaattg atgatagttg 60

tagctgctga ggttgcacgt cgtagaaaag caagaggact taaacttaat catcctgaag 120

cacttgcttt aatcagtgat gaattattag aaggcgcgcg tgatggtaaa acggtagctg 180 aactcatgag ctatggaaaa acaattttaa acgaggaaga tgtcatggat ggcgtagcta 240

acatgattac agaacttgaa attgaagcaa cttttccaga tggtactaag ttaataacag 300

tccatcaccc aatcgtttaa 320

<210> 196
<211> 503
<212> DNA
<213> Staphylococcus epidermidis

<400> 196
atgcaaatta tggagatgaa gctactttcg gtggcggaaa atcaattcgt gatggtatgg 60

ctcaaaatcc taatgtgaca agagatgata aaaatgtagc cgatttagtt ttaactaacg 120

cattaattat tgattatgac aagattgtta aagcagatat cggaattaaa aatggttata 180

tttttaagat cggtaaagct ggaaacccag atataatgga taacgttgac atcatcattg 240

gtgcaacaac tgatattatt gctgctgaag gtaaaattgt tactgccggc ggtatcgata 300

cacacgtgca cttcatcaat cctgaacaag ctgaagttgc acttgagagt ggtattacaa 360

cgcatatcgg tggaggaact ggtgcttctg aaggtgctaa agcgactact gtaacaccag 420

gaccttggca tattcatcgc atgttagaag cagcagaaga gatgcctatt aatgtaggat 480

ttactggtaa aggtcaagct gtc 503

<210> 197
<211> 452
<212> DNA
<213> Staphylococcus epidermidis

<400> 197
tgattataga agaaattcaa ggaaatattg ctaatttatc tcaagatgaa aagcaaaaac 60

atgtcgaaaa agtttatctt gaaaactcag atttggttaa acgtatacaa cgtgttaaaa 120

cagatcacgg taatgaaata gggatacgtc ttaaacaacc tattgaccta caatatggtg 180

atattttata tcaagacgat acaaacatga ttattgtcga tgttaatagc gaagacttat 240

tagttattaa acctagaaat ttaaaggaaa tgggagacat tgctcatcaa ctaggtaatc 300

gccatctgcc tgcccaattt acagaaactg aaatgcttat tcaatatgac tatcttgttg 360

aagatttatt aaaagagttg ggtatcccct actcacatga agacagaaag gtcaatcaag 420

catttcgaca tataggacat tcacatgatt ga 452

<210> 198

<211> 524
<212> DNA
<213> Staphylococcus epidermidis

<400> 198
ttaacttatt cagatgggat agctatgaga attgtctacc acgcattaat taacaatgac 60

aaagataaaa ttttagatat taaccaaaaa ctcttcgtac aaaatctacc taaagaaacg 120

cgtattggcg ctaagcaaat gggtacacgc atggtaaaat tagctttaga tctttatgat 180

agtgaatgga ttcaatggta ttataatcaa atgaaaaaca ataaaattaa gcttcatcct 240

gctgtgtgct ttactatgct aggacatttt ttaggtgtag atgtggaatc catcattgat 300

tattatttat atcaaaatat ctctagcctt acccaaaatg cagtaagagc gattccttta 360

ggacaaacag ctggacagca agtcgtaact gaaatgatag cccatattga gaagacacga 420

aatcacatac tagaattgga cgaaatcgat tttggtatga ctgctcccgg cttggaactt 480

aatcaaatgg aacatgaaaa tgttcatgtt cgaatcttta tttc 524

<210> 199
<211> 500
<212> DNA
<213> Staphylococcus epidermidis

<400> 199
tcgtatatgg aatttgtagc agatcctatt attgcctatg aaaacgctaa atttttccaa 60

cataatacgt ttaatcttaa agaagatagt gctatgtttt acactgatat attgactcca 120

ggctattcat ctaatggcca agatttcacg tataattata tgcatcttat taatgaaatt 180

tacattgaca atcaattagt tgttttcgat aacatgatgt taagtcctga taaaagcaga 240

cttgacggca ttgggtatat ggaaaattat acacacttag gatcagctta ttttattcat 300

ccagatgtaa accaaagttt catagacgat atttacgcgg cggttgctga ttttcaaaaa 360

caatacgact gtagaatagg tatctcacaa ttacctactc atggattggc cgttcgtatt 420

ttgactaaaa gaactcaaat aatagaagaa attttgactc gtgttcaatc atatatcaat 480

caaacgattt atcatcgaca 500

<210> 200
<211> 363
<212> DNA
<213> Staphylococcus epidermidis

<400> 200
gcttaacaac gtaaaacaag ctggcgttga tcaaattgta actattattg gtcatggcgc 60

tgagagtgtg aaagatacat tgggtaatca atcattatat agttttcagg ataaacaact 120

tggaacagct catgctgtga aaatggcaca tgaacattta gcagataaag aaggaactac 180

tctagtagta tgtggagata caccacttat tacataccaa actttacaat cacttattga 240

acatcatgaa agtacacaat cacatgttac tgtattatct gcttctacta tcaatcctta 300

tggttatgga cgaattatta gaaatcataa tggaatatta gagcgtattg ttgaagagaa 360

aga 363

<210> 201
<211> 780
<212> DNA
<213> Staphylococcus epidermidis

<400> 201
agctcacggc tttaactatg ctatttataa agatgtggtt ttagatttct gaaaactgga 60

atatattctc tttgttgatc tactaagtct acatcgatat gtgttgttag tactccttct 120

ttatcatcta aatggtctaa aatttcacca ttaggattaa tgacaattga atttccagca 180

taattggtgt gaccatcatc accacaacta ttacaagcta caataaaaat atcattttcg 240

attgctctcg cttttagtaa tgataaccaa tgatctagtc ttgagctagg ccactgcgct 300

acataaaaag caattttagc acctttttcta gctggatagc gcaatatctc tggaaatcgc 360

aagtcataac aaatgatttg cgtcacaagt gtttgatcag ataaataaaa aggttcaggg 420

actacatttc caccacataa aaagtctggc tcacgtaaca ttggcacgag atgtactttg 480

tcatattcat taatcaattc tttgtttta ttaattgcaa aagcagtatt atatatatgg 540

ttttctctta tatttgacac tgaacctgca atgatatcta cattaaatgt atgtgctaag 600

tcttttataa agagagagct gtctttaaga tttttatcag ctttttgttc taattcttct 660

aatgcataac cgttattcca catttctgga agcacgacga cactggtatc tttatctaag 720

tattgattaa acttagtttt gatattttgc atatttttat caacatttcc acgttctaca 780

<210> 202
<211> 501
<212> DNA
<213> Staphylococcus epidermidis

<400> 202
gtatttacgt gcgtttattt gtgtcataat catcgtgaca cacttactaa cgcaaatcac 60

tttagaaaat gaacagatgt ctgatagttc actcatattg caatattata tacgcaatat 120 ttttattttc ggcaccccta gttttataat attgtctcaa ttattaacaa cattaaatta 180

cgaatcagta actataaatt atcttttttc aagatttaag tatattttta ttccatatct 240

tttaatcggc ttgttctata gttatagtga atcacttatc accgcttctt cttttaaaaa 300

gcagtttatc gaaaatgttg ttttaggaca atggtatggc tatttcatta tcataattat 360

gcagttcttt gttctatctt atatcattta caaaattaat tttagattgt tcaatagtaa 420

aattttgctg cttttagcat ttatagtcca acaatcttat ctacattatt ttttgaataa 480

tgacactttt catcaattca t 501

<210> 203
<211> 300
<212> DNA
<213> Staphylococcus epidermidis

<400> 203
ggtcaagccc agacagaggc aatatccaac ggtaacctct tatttaaata tagttaggga 60

gagcttattt attactatat ccggagtatt ttggatgtat tgtatcgttg tgatgattgt 120

ttatatagga actcttatca attctcaaat ggaaagtgtt ataacaatac gtattgcatt 180

aaatgttgaa aacacggaaa tttacaaatt attcggatgg atgagtttgt ttgtacttat 240

tatatttatc ttttttacat ttagtctcgc gtttcaaaaa tataagaaag gtcgtgacat 300

<210> 204
<211> 406
<212> DNA
<213> Staphylococcus epidermidis

<400> 204
catttaacag tgaatatact tggtctttaa aacggttttt actgtcctca ataaccccga 60

atttttgtga aaaggaggct ctaaaatacc aagtctcaag aaaaagaaga attaagttta 120

taaagtcctc tttattcaaa gcgatgtgcg taggatcata atactttatc aattcatcat 180

gtaaggtagt attaatttct tgaagatggt gtttgatttc tgaattcagt gcttctggag 240

cactagataa ttgaacatat aatttaatat atctctcatc aacgtcgaat ataaatttga 300

ataaaaactg gtaaagtccg tcaatggaat aattatcgtc atggttccta agcaaaaaat 360

ctataaagta attgaaacaa ttctcaacac tttttcgata tatttc 406

<210> 205
<211> 325

<212> DNA
<213> Staphylococcus epidermidis

<400> 205
atgtcaaaat tagcagaagc tattgcaaat acagtaaaag cagcacaaga tcaagattgg 60

actaaattag gaactagtat cgttgacatc gtagaaagtg gcgttagcgt attaggtaaa 120

atcttcggat tttaattaat cttagttttt taaaatataa atttaaataa ttaattaggg 180

agagataaac atgtcaaaat tagcagaagc tattgcaaat acagtaaaag cagcacaaga 240

ccaagattgg actaaattag gaactagtat cgttgatatc gtagaaagtg gcgttagcgt 300

attaggtaaa atcttcggtt tctaa 325

<210> 206
<211> 451
<212> DNA
<213> Staphylococcus epidermidis

<400> 206
tgacacaata cctcatgaac cacccaaata agttgatacc cctcacttat tttgtaaaga 60

aatttaaaca agcaaaatcg tcaattagtg aagacgttca aatcattaaa aatacgtttc 120

aaaatgaaaa attaggaact attattacta cagcaggtgc tagcggtgga gtaacctata 180

agcctatgat gagtaaatca gaggccacag aggttgttga tgaggtgata gagcaattac 240

aagagaaaga ccgtttgcta cctggaggat atttattttt atccgattta gttggtaatc 300

cttctctatt aaataaagta ggtaagttaa ttgctagtat atatatgaac gaagaacttg 360

atgctgttgt taccatagcg actaaaggga tatcacttgc gaatgcagtc gcaaacgtat 420

taaatttacc tgtagtggtt ataagaaagg a 451

<210> 207
<211> 300
<212> DNA
<213> Staphylococcus epidermidis

<400> 207
gtgacagatg taagacttag aaaaatacaa acagacggca gaatgaaagc actcgtttcc 60

attacgctag atgaagcttt tgtaattcat gatttacgtg taattgaagg aaactcaggt 120

cttttcgtcg caatgccaag taaacgtaca ccagatggtg aattccgtga catcgcgcat 180

cctatcaatt ctgatatgag acaagaaatc caagatgcag tgatgaaagt atatgatgaa 240

actgatgaag ttattccaga caaaaatgct acttcagata acgaagaatc agacgaagct 300

<210> 208
<211> 380
<212> DNA
<213> Staphylococcus epidermidis

<400> 208
atgaaaataa tcaactcaga taaggtaccc gaagcactag gcccatattc gcatgcaact 60

gttataaacg gttttgtctt tacatcaggt caaattccac tcacacttga tggaacaatt 120

gttagcgatg atgttcaaga acaaactaag caagttttag aaaatttaac tgtggtatta 180

aaagaagcag attctgattt gaattctgtt gttaaagcga caatctatat ttctgatatg 240

aatgattttc aacaaattaa tcaaatctat ggaaactatt tcgtcgaaca ccaaccagct 300

cgtagttgtg ttgaagtgtc acggttgcct aaagacgtaa aggtagaaat tgaattgata 360

ggtaaagtga aggaattata 380

<210> 209
<211> 245
<212> DNA
<213> Staphylococcus haemolyticus

<400> 209
atgaacatga gcgacatcat ctttcttaat ggcatgcgtt tttatggcta tcatggagcg 60

cttcatgcag aaaatgaact tggccaaatt tttatagtag atgtaacact taaagttgat 120

ttgactgaag cagggaaaac ggataatgtc aaagacactg tgcattatgg tgaggtcttt 180

gaagatgtta aaaacattgt tgaagggcca tcttgtcaat tgatagaaca tcttgcagaa 240

cgtat 245

<210> 210
<211> 563
<212> DNA
<213> Staphylococcus haemolyticus

<400> 210
ttgaattggg aacgacagct ttgaaaggtg caatcgattc agcaaatatt gatcctaata 60

taatacaaca agttattttc ggtaatgtgc tacaaagtgg tgtaggacaa aacccagcac 120

gtcaaattgc gattaaagcg ggtgtacctg atacaacacc agctatgaca attaatgagg 180

tatgtggatc aggtcttaaa gcaattatat tagggaaaca gttaattcaa ttaggtgaag 240

cggatgtagt agcagtgggt ggagttgaaa gtatgacaaa tgccccacaa ttaatcttaa 300

aagaaggtca agaaccagtg gaaagcttta tgcatgatgg tttaacagat gcctttcatt 360 atgtaccaat gggtgtaaca gctgagaaca tagctgaaaa atatgacatc acgcgtgaaa 420

tgcaagatga gttcgcaaat cattcacaag ctaaagcagc taaagcgacg caagatggta 480

aatttaataa tgaaatcatc ggtatgactg acgcagaagg ggaacaaatg acttctgatg 540

aaggtgttcg cccaaatagt agt 563

<210> 211
<211> 231
<212> DNA
<213> Staphylococcus haemolyticus

<400> 211
aatgacgatg aaacttcctt tgcacaccgt gttgaagcgg atggctggga aaatgaattg 60

gctatggttt ttgttgttat taataacaaa tctaaaaagg tatccagtcg ttcaggcatg 120

tcacttacac gtgatacatc acgtttttat caatattggt tagataacgt tgaaccagat 180

ttgaaagaga ctaaagaagc cattgctcaa aaagatttca agcgtatggg t 231

<210> 212
<211> 278
<212> DNA
<213> Staphylococcus haemolyticus

<400> 212
catcaattgt gtgataatga taagaattat atgcaagttg ttaaacatat tggttcttta 60

gtgtattcag ctagtgaagc gattgagcat catagttttg atcaattagc tacaatcttt 120

aatcaatgtc aagatgactt aagaacattg acggtgagtc acgacaaaat agaaatgttt 180

cttcgcttag gagaagagaa tggttcagtc gctggcaaat taacaggtgg cggccgtggt 240

ggtagtatgc ttatcttagc taaagaattg caaacagc 278

<210> 213
<211> 200
<212> DNA
<213> Staphylococcus haemolyticus

<400> 213
acgtatatcg tcctgaatat tttctaagta gtaaatagac ttatcgtcat cagtttgttc 60

agtagcgtga tcgaattcta aatcatcgaa tcgcttgaag aaactttcat agtcttcaac 120

tgaaacttct tgacgttcat tcaataaggc tttatgtcct tcaatatcta attgtttttc 180

atagccttcg actagcgtag 200

<210> 214
<211> 565
<212> DNA
<213> Staphylococcus haemolyticus

<400> 214
aatcgtccac ttgtcttttg aaaatgactt catataaact ttgcctaact taatttgaaa 60

ggtaaggttt atggcgcatc aatttataca actagagaag acctttaaag cattccaaaa 120

tagtcgtagt agtcacgaac aagatagatt atttatagat atagtaaacc acatacaacc 180

taaacttttt ataaaattta aaagttatgg aatacaaaat gaagatattg aagatttagt 240

acaagaaact ttaatcagga tttatttagc acttcataca tttgatttta gtacagacgt 300

tccttttgaa cactatttga attgtatcgt acgatcgatg cgaaatgatt tttggagaag 360

aaaatatatt gagactgata agtacgatag catcattaat gactatgtta ttgactacaa 420

attgaatcaa tcaagtaaat atattgaaga tatttgtatg ataaaagaga aacgagaatt 480

gctagcgagt agtttaacag tattaagtcg attcgagcga aacgtagctg aattactaat 540

gtctgattat acgcctagtg aaatt 565

<210> 215
<211> 635
<212> DNA
<213> Staphylococcus haemolyticus

<400> 215
ccaagatgct aatgtgtctt caaaagaatc ggaaatcgac aaaaatatta ataaagtaga 60

cgacgcgcag tcttattctc aacaaaatga gcaacaatcc tcaaaagccg aaaataagga 120

aatacagaat tcaacacaag cagaacaagt tgaaaaacag gaacaacctg cttctaatca 180

gacggctaat cactcttcaa aagagtcctc cattaataat caggaaagtc ataacaaaca 240

gcaacctagt gatgacaaaa cacctaatat caaaccagaa aaaattgaaa aagtagataa 300

tcataagcgt attcaagatc agtatcaaga taaaaacaag caggttgata ataatcaatc 360

taacaattcg caattaaacc aaaaagaaca tcccaattca tcaaataata aacaacaaaa 420

gcaacgtcta gatgttaaac cacaaaacga taaccaacaa ttacaatctc gaaatgatgt 480

aaaagaaaaa ttagataacc agccaattga gcaaaaagat accaagctgc aaagtaacaa 540

taaaagcaaa gacaacacaa cttctgtaaa gtcacacagc caacaacata aaccgcattc 600

attaaagacc caatcccatt taactccagg tcaaa 635

<210> 216
<211> 468
<212> DNA
<213> Staphylococcus lugdunensis

<400> 216
tgcgaattaa acagttaggc attaatgatc aaatgaattg cgtaaaattg tataatgata 60

ccaaggagcg tgacgctaat ttgaaggcga tagacaaaaa aattgaaaga tttgctagat 120

acttgcagcg tcaaaacaat ctagaccata ttcaattttt gaagatacgc ctaggcttac 180

aagtcgcatt aggtaatttt ttcaaaacta ttgttactta tggtgttgct cttttattcc 240

atacctttct ttacacatta attacacact taacgtattt tttcgttaga cgttttgcgc 300

atggtgcaca cgcaaggtca tcattgttgt gccacattca aaatttagtt ttatttgtgg 360

cattaccttg gtcaattgtg cattttcaag tgtcttggac attcatgatt tttgtagcat 420

ttatcgcatt cataattatt atatgttacg caccatcggc aactaaaa 468

<210> 217
<211> 450
<212> DNA
<213> Staphylococcus lugdunensis

<400> 217
tttaatgttg ttatttgttg ctaaaatagt agccgatatt aaatttcaaa tgagggatta 60

ttttgccatt tttggtatca taatcccttc aactatactg tttggcgtga taggtagaca 120

gtctttaata tttttgataa ttggatgttt aatattcttt tatttgaaaa taggcttata 180

ttccgtttta gcaatctttg gttctgcgct tattatgtat gttagtaatt atatttctgt 240

catccttagt gtaattgctg attatttttc tttaagttat atagttcaaa taataataat 300

attagtttcg tttactctaa tatcaataat ttgtgcttat ttcattaggt ttctattaat 360

aagctcaaaa aaaacctatc tgtatttcaa caaaatatac atatcagtaa tatctatttt 420

ccttatttta tctttgatca tgctctattt 450

<210> 218
<211> 466
<212> DNA
<213> Staphylococcus lugdunensis

<400> 218
tatcaatctt tcaagcagtt atgttaataa ttgtagctaa aattattgca aacgttaagt 60

tttacttaag ggattattta gccgttgccg gcataatagt cccttctgcc gtattatttg 120 ttgtttttgg cagacaatca attatctttt tacttattat ttgtttaata tacttttatg 180

taaaaatagg gttttattct ataatcgcta tattaggctc tgccttaata atgtacataa 240

gtaacttttt ctcagtttca ctcataatat taataggtaa ttttatcaaa tttaggataa 300

tatacgtaat aatttcttta tcatcataca tactgatagg tgttttatgt gcatttatga 360

caaaatactt aattaataaa ctcaaaaaaa catacttatt ttttaataaa gtatacataa 420

tcgtcatatc tactttttta acatttacca tcgctatatt ttattt 466

<210> 219
<211> 512
<212> DNA
<213> Staphylococcus lugdunensis

<400> 219
caaaggagtg tgattttatg tcaaaaatgt tagttctttt ttctacatgt attcttttaa 60

tgtcgatgtc gttaattttt atgcctgtta gtcatgcgca aggtttatcc tctaagcaag 120

caacgttgta tcagcagaat ccaaaagata ctaatactca agtttcagga aaactgaata 180

attcgaaaga aacaaaagca aatgatacag caaccttatt tgcaaactct aaagtcaatc 240

aatatattat cgacaatcat cttcagcatt cgccagtagt aaaagatcca cgtatggata 300

cacttcctaa attagaatat aaaaacggca cttacatggg tgttgttatt cacgaagtgg 360

gcgaagacaa tcgtccttta caagtatggg tagatcgcat gtatgaaact tatactagag 420

catttgtaca cgcattcgtt gataataacg aaatacatct tactgcacct gcagaatatt 480

atgtgtgggg agctggtcct aaagctaatc ca 512

<210> 220
<211> 646
<212> DNA
<213> Staphylococcus lugdunensis

<400> 220
gaagtggagc gtaatttgtc aaaacaacaa atacagcata ataatgatgc tactggtgac 60

actcaagatg ataataatta taataatgaa atatcaaatc aggaagcaac aacgcagaac 120

aaacaaataa ctcagtctga caatgtaaat agcgaggcac aagcaataaa tgaaataagc 180

gacagccatc gtacagtaaa taaagccact gaagcactag acaataactc tactttaaat 240

acatccaccg atgtatcacc tgcaacgaaa caagatacaa ctactagcaa tcaaacaact 300

caggaaaaca atgatgcaac aacacaaacc aaaacaaatt ataagcaaga tggtaataac 360 aacgtattat cccaagtagc aaccaatgac aatcagtctt caaatcaacc acgtaacagt 420

cacctaaata catccacagt aacatacaac aataatcatc aagtaagaag attagcaaaa 480

gttgaagcaa caaatacaga taataacgtt actcagactt cagacatatc gaataaactc 540

tcaaatgtaa cagcgacaat tgaagcggca gatacgattt acccacataa agcagaatat 600

gtaaatttaa attatcgttt ccaagcccca gatgatgttc aagcag 646

<210> 221
<211> 500
<212> DNA
<213> Staphylococcus lugdunensis

<400> 221
tgtcaggtat cgtagatgca attactaaag cagtacaagc aggtttagat aaagattggg 60

ctacaatggc tacaagcatt gctgatgcaa tcgctaaagg tgtagacttt atcgctggtt 120

tctttaacta aaatataaat tgagacttta acaataatcg taaaaaggag cgtttacaat 180

atgtcaggta tcattgaagc aattactaaa gcagtacaag caggtttaga taaagattgg 240

gctacaatgg gcactagcat tgcagaagca cttgctaaag gcattgacgc aatttcaggc 300

ttatttggtt aatctcaaat ataataaata atactattta aaataaaaat atttttaaag 360

gagcgaacat atcatggacg gaatttttga agcaatttct aaagcagtac aagcaggttt 420

agacaaagac tgggctacaa tgggtactag cattgcagaa gcacttgcta aaggtgtaga 480

ctttattatt ggattattcc 500

<210> 222
<211> 500
<212> DNA
<213> Staphylococcus saprophyticus

<400> 222
gaaataaccg cattccaact aacactttaa ttaatggaga aaagagaacc aaaccaatcg 60

atgtgcctga aatttttaaa gtcttaagct caatgattcg tagacgttta tatcattttg 120

ctatacatcc aaatgaccaa gaagatttgt gtcaagatgt gctcgtaaga ttatactgtg 180

catttaaaaa atttgatttc actgatgaca cacctattga gcattatgta aatcgtgtga 240

ttaaaaatgt aaaaaatgat tatatccgta aaaaatgcta tggcaaccaa cgacaagaaa 300

tgctggtcaa tgaatttata gtcaatgatc aaaatagtaa aacagaacac ccacttgata 360

aacatatatt agctttagag ataggaagtc aattacaaca gggattaatg aaactgacgg 420 tcttagaaaa aagtatcgta atctatttac taaatgactt taagccgaaa gaaattgctg 480

aaacactaaa tatacaaatc 500

<210> 223
<211> 432
<212> DNA
<213> Staphylococcus saprophyticus

<400> 223
aagagaacca aaccaatcga tgtgcctgaa atttttaaag tcttaagctc aatgattcgt 60

agacgtttat atcattttgc tatacatcca aatgaccaag aagatttgtg tcaagatgtg 120

ctcgtaagat tatactgtgc atttaaaaaa tttgatttca ctgatgacac acctattgag 180

cattatgtaa atcgtgtgat taaaaatgta aaaaatgatt atatccgtaa aaaatgctat 240

ggcaaccaac gacaagaaat gctggtcaat gaatttatag tcaatgatca aaatagtaaa 300

acagaacacc cacttgataa acatatatta gctttagaga taggaagtca attacaacag 360

ggattaatga aactgacggt cttagaaaaa agtatcgtaa tctatttact aaatgacttt 420

aagccgaaag aa 432

<210> 224
<211> 200
<212> DNA
<213> Staphylococcus warneri

<400> 224
aaaagatatg acataatgtt acgaatagtt aaactatccg gatcaaatgt taactttaca 60

cattcagcat aaccatcgta ttcaccattc aaattcgatg ttattccatt agcccttcca 120

gcttcagttg atacgatacc tggtatagtt ttaaaaaaag cttgaacgcc ccacaaacaa 180

ccgccagcta catatactat 200

<210> 225
<211> 515
<212> DNA
<213> Staphylococcus warneri

<400> 225
catccaattt acagaaccat ctttttcatc tatgactgca ttattaatta taatgcttac 60

taaattgtcg attgcatcgt caatattgtc tgaatttact atttcatatc cataatttat 120

aaatccatta ccatcaataa ataatttatt ttgactttct aatgaaaatt ttattagttt 180 acattgaaac aacaaatctt tcaaagaata tctttgcgtt ttttctaaaa atacattgag 240

tgggtttttc aataagtgat gtaccgtatt atttttaata tcttttaccg aaacactttg 300

gaccttagta taaaaatagg gtactgaaag agtttctatt tgttttattt ctgaatttat 360

taacttatca cttaataaat tttcaccgta ctcttctagt ttgttaaaca agctctttcg 420

cttatttgca taaagaggtg atttagcagc ttgtattaat actgagtact caattgtact 480

tcttggtaaa attctcactt ctacttctga tgacg 515

<210> 226
<211> 320
<212> DNA
<213> Staphylococcus warneri

<400> 226
tgtatcaact ccactttatt catattaatg acgacgcact tacactcaca aagtcaaagc 60

aagacaccat tcacttattt ataggcaatt ggattaaccc atcagcccaa aaatctatta 120

gcattcgaac tggcgttgat acgaatcaca atcaatatca aattcttcaa attgataccg 180

aacatcaacg tattaaactg acttctgaag aagatcctca actcatgtat attttagact 240

acgaagatac aaaccatata ttcatacaaa catcagttaa gaattcgtat ggcacgtcaa 300

gacccataag atacgaaaaa 320

<210> 227
<211> 271
<212> DNA
<213> Staphylococcus warneri

<400> 227
agcaagttct ttgttaattg caactttgac atcagcgaca ttaattaatc cggcacatgc 60

agaaacgaca tcatcaaccg ataatcacca acaaaccaca caatctcaac aacaaaagac 120

accgaagatt gataaaggta ataacgtcaa acctgttgaa aagaaagaac gcgcaaatgt 180

catactacct aacaatgatc gacatcaaat taatgataca acgttaggtc actatgctcc 240

tgttactttc gttcaagttc aatcaaacga a 271

<210> 228
<211> 500
<212> DNA
<213> Staphylococcus warneri

<400> 228
tattgtcaaa gtcacaacaa ttagatatag aattaaaagc gatacttcaa caattcaatt 60

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cttttattat gagaagaatt aattatattt ctcaaaatga ttttgaaaaa gacgaccttt    120

atcaagaagt gctcatcaaa atatatctag cgcttgagcg ccatcatttt caatatgatg    180

attcgtttat aaaatatata tcgcggctca tcaaatcagt taaatgtgat tactatcgac    240

ggcattacac tcaacagaag cgatatacga atgtagttaa tgatgctgtg gttgaatatc    300

aaacgaacct gcttaataga gatcgagttg aaagagaaat attaacatgt gaagcaatca    360

aactattgaa cgcggcgtgt gagaaattaa ctaaacaaga acgagaagta tttgaatttt    420

atagtaaagg ttataaacca aaagaaatcg cacatttact aggtataaaa gacaaagtag    480

tttacaatgc gatacaacgt                                                 500

<210>  229
<211>  400
<212>  DNA
<213>  Staphylococcus warneri

<400>  229
tcagatataa acaatttaac aaggatgtta tcactgtagc ggttggctac tatctaagat     60

atgcattgag ttatcgtgat atatctgaaa tattaaggga acgtggtgta aacgttcatc    120

attcaacggt ctaccgttgg gttcaagaat atgctcccgt tttgtatcaa atttggaaga    180

aaaaacataa aaaagcgtat tataagtggc gtgttgatga gacatatatc aaaattaaag    240

gacagtggtg ttatctgtat cgcgcgattg atgcagatgg acatacatta gatatttggt    300

tgcgtaagca acgagataat cattcagcat atgcgtttat caaacgtctc attaaacaat    360

ttggtaaacc tcaaaaggta attacagatc aggcaccttc                          400

<210>  230
<211>  758
<212>  DNA
<213>  Staphylococcus warneri

<400>  230
taatcaaacg caacaacaac cttcagaacc aacaaaagcg aaagattctg atacaaataa     60

tacgaatgtt gaacgtcctg aatcgaattc gacacaaaca tcaaatcaag acactgacaa    120

aatgcaggat acatcaacta atcaaacaaa cgaaaattct aaacatatta ttgataaaac    180

taatgacgtt tcacatgaaa ctacaaagac aaatgataca gatcaaacgt catctcaaga    240

caattcagaa caatctcttg aagtcgactc aaatgaggca ccagcttcaa atgacaaatc    300

aactccaacc aaacaagaac ctactaattc aaagcaagat attgatgaaa catctaaacc    360
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taatgaagat tcaaaacttg taccatcaaa gtcaaatata acatctaaag cagataaaca 420

agaacagtct tctaaagaac ctgttgagga taatgctcaa aaagataaac atgtatcaca 480

agaagattca tctttagaaa agcaaggtac acaagaggtc ccgcagactg acacacataa 540

agatgtcaat gtaacacctt caaagtcatc atcagaacaa caactatcta caacacaaca 600

cattacagct aaagattcta gtgcttcaca agaggtgcca gttcattcac tagattcatc 660

taaacaagat cacacaacat cgactgagag ccatatcaat ttagataacc tagataaaca 720

agcgactaaa gatcgtacac ctacagataa tggcgatg 758

<210> 231
<211> 562
<212> DNA
<213> Candida albicans

<400> 231
aaacgcattg ttaagagacc cagaaatcaa aactggtaaa gtgtctgttg cttcatactt 60

gaagtttttg gattctgttc aattcaagag ttatggagac gaacctttgg aagtattggc 120

tattgtggta gaacaaaatg acaaaattcc taaattagac gagtttttgt catccaagac 180

aggttggtta aacaatgtta ccgataatat tttcaatgct atcaagaaag attacagtca 240

attatgttgg gttgttaatg aaaacgatgc caacttacct tggtatttct ccaaatcaga 300

tggttcattt gccaagaatg gccaaatctt gttttggtac ggtttaaaca ttgacgaagc 360

tagtaaattg attaaagaat ttgattcttc atctattgga tcatcgttgt catcttctaa 420

agaatctggc gtattcacat ctgctcaaca aaagcgtggt ttccaccact ctacagtccg 480

tagaaacacc aatcctaatc ctccattatc tgaaggtaag caaaccgaga gaaaaaaagt 540

tgctttgatt ggtgctagag gt 562

<210> 232
<211> 524
<212> DNA
<213> Candida albicans

<400> 232
caggtaagtc aaagtctggt gagttatctt ctactggttc tgtgacaact aatacagcaa 60

caccagatgt tccatcaact aaagtacctt cgaatccagg ggcaccaggt actggtgttc 120

caccaccttt agcaccatcg acagaaacac aaactaccaa taatgtacca ggctcaccaa 180

atatccctgc cactggaaca actgatatta ttagagaatc aactactgtt tcacacacag 240 tgaccgggaa tggaaatact ggcgttccaa tgaatccaaa ccctgcgttg acaacaggca 300

cttcactgac tggcgcaacg aattctgcaa ctaacccatc tcatgaaaca ggtgttaata 360

caggatcagg aggctcaact aatattgtca ctccaccttc ttctgcaact gcgacagtgg 420

ttattccagg aactgataat ggtgctacta ccaagggtca agatacagct ggtggcggca 480

actctaatgg atctactgct accaccaata tacaaggtgg caat 524

<210> 233
<211> 230
<212> DNA
<213> Candida albicans

<400> 233
gattaatgac atcaagggtt tagttaaagg cattaaaggc aaaaacggga aatcctactc 60

aagtgtccca gttgggactg ttgattcttg ggatgtctta gttgatggtg ccagtaaacc 120

agccatcgat gctgcagatg ttgtctactc caactccttc tcatactggc aaaaaaacag 180

tcaagctaat gcttcatact ctcttttcga tgatgttatg caagctttgc 230

<210> 234
<211> 632
<212> DNA
<213> Candida albicans

<400> 234
tctggtgaag gtttaggaag aaagaaatca ttaattagac cagaaagatc aagaatggat 60

gaaagccatc cacgattcca ttatactcaa gttgcaaatc aagaatctaa tcatattaaa 120

gtacagccat cttcaactgg tgttgatcct cgtaaatcaa atgaattatc aacatcaaga 180

tcacatttga gtaattacgc tactccacca catcaagagg aagaagaaga cgaagggatc 240

cctttaatgg atatacacaa tgcttcaccc aatgttagca gtgaccaaaa taatgatcta 300

aaaggtggac gtgaagttta tggattaaat gatgaaatca acgattatgg tagttcaccc 360

aagaaaaacc aagtcatttc atcttcaaga ccaatgaaca acgaaaaacc agctaaacct 420

aaacatgata tatatttctg gaaagtttat tgttatgcta ttacattttg ggcaccagct 480

ccattattga aattatttgg attaccaaca aaagatcgtc aattcgcttg gagagaaaaa 540

atagggttga tttcttgtat tctttacgtt ggggcatttg ttgcttattt gacttttggt 600

ttcactaaaa ctgtttgttc gagtcaagtg gt 632

<210> 235
<211> 633
<212> DNA
<213> Candida albicans

<400> 235
caccaaactc aggcttattc aaacaaggat actcctcctt ctccaatgcc gacggagcca 60

ttatcagaaa tgttgaagca gttcgtgaaa tcgcctctat cttactcacc tccatgggtc 120

caagtggaag aaacaagatc atcgtcaaca agttgggcaa aaaattcatc accaacgatg 180

ccgccaccat gcttaacgaa ttggaaattg tccaccccgt agtgaaaatc ttgatccagg 240

catcaaagca gcaggaattc gaaatgggcg acaacactaa cctagtaatc atccttgctg 300

gcgagttcct caacgttgct gaaaaattgt taacattggg cttgaatgtc agtgaaatca 360

tccaggggtt caacttggca aacaagtttg tgatgaaaac attggacgag ttggtcgttg 420

aaaaagtcga gtcgttcgaa actgacctat taaaagcagt gaagccagtg atcgccgcta 480

aacagtacgg cgtagaagat accatcgcca aactcgtcgt tgatgccgtt gccctagtta 540

tgaagaacgg gtctttcaat gtcgacaaca taagagtggt caaggtcatg ggtgcatcgc 600

tctcccaatc gcaagtggtc aagggtatgg tct 633

<210> 236
<211> 465
<212> DNA
<213> Candida albicans

<400> 236
gaatgcaaag aaacattgaa atcaagagta ttttgatcca attgaccatg tatgctaagc 60

ttaacgaaag ggtcgactat ttgttggaaa agttaacatc cactgaatta ttggatagtg 120

aaaaagtcat gtcaaagttg aattcagaat ttgatcctca agaaaaattc gattatgata 180

aattgattaa agacaagggt ctgaccttga gaaaaggatt gaaagatttg aaattcgata 240

gagaagagat tgaaaatact ccttgctata atgaaatgat tgaagatttg tttgttcaaa 300

tcaaggatga tcatccagag acaaaaaccg atggcgacaa attgattgaa tacttaaaag 360

aacatagaaa caggatcgac gatgttttgt ctaaacagac tataaaattg gatgatttat 420

tgtaccagaa agctcaattg atagtaagtg atgatttgca tacgg 465

<210> 237
<211> 504
<212> DNA
<213> Candida albicans

<400> 237
tgtctgctgc tagtgaatcc aaatattcta ctgaagtgct ttccgaatta ttgagcaaat 60

tacaagttgc tgataataag gatgaagctg cttccaacat ttccactttt ttaaactcat 120

ctattgttga acacgatgtt ccagttgaat ttttcgaaga tttgaaaaaa caaattcaat 180

ctaaagatgc taaagtttct cttgctgctt tggatgctta caaacacatt gcttcaacca 240

acggtttatc cccatccgtt gaaccatatg ttgttgactt ggttagtgaa gttgccgtta 300

aagctggtga caaaaacaag gatgttcaaa ctgctgcttc tgatgcttta ttggccattg 360

cttctgccat caccccaact gctgtcaaag ccatcttacc aaaattgatt gacaacttga 420

ccaacaccaa caaatggact gaaaaagttg ccatcttgag agctgtttct caattggttg 480

acactgctaa agctcaaatt gctt 504

<210> 238
<211> 526
<212> DNA
<213> Candida albicans

<400> 238
tgacaggttc attggtgtct tacaaaagtc ttggtaaaaa aggtggattt tggattttca 60

cattattcaa ttatctctgt atcggtgttt tgacatcttt gttcattgtc tccattggta 120

atagaccaca tgcatcaaag aatattttca aaacattaat catattgtta accatatgtg 180

cattatacgc attggtggtt ggatttgtgt ttgttatcaa tactattgct acttttggaa 240

ccggtggaac atctacctat gtgctcgtta gtattgtggt ttcattgttg tccacctatg 300

gtctttatac gttaatgtcc attttgtact tggacccatg gcacatgttg acttgttctg 360

tacaatactt tttgatgatt ccatcgtaca cttgtacatt acaaatattt gcattttgta 420

atactcacga tgtctcgtgg ggtacaaaag gtgacaacaa tccaaaagaa gatttgagta 480

atcagtacat tattgagaaa aatgccagtg gagaatttga ggctgt 526

<210> 239
<211> 621
<212> DNA
<213> Candida albicans

<400> 239
tcagatggtg atgaactgtc gattgaattt cttaaccaaa gaagcaacac tccattaaca 60

caaggaactt ataattatca taatacttct actaattcac ttaatttcca acaaccagaa 120 ccaatttatc gtaatcaaac tcgtacatct ttaagtgatt cttattatga tcatcccata 180

tttgacactt ctcaaacaca gatccaacct ccacatgata atccattcac tgaaagttat 240

gaaatgacag atacttcata tcaaggtaat gatcatcatt atcgtactgg tcaacctaat 300

catctcatga accccactta taaccaagct ttcattcctc atgtttatga tgaagaagat 360

aatgatgaac aagaatatga tcaacgtatt cagtataatc aatttcaagg ggatcatttt 420

gatttggcag cgattagtta tgctgatgat gaaagtcaaa gtcagttgga ctatgtcccc 480

actgaacgtg tcatacctga aggagaggaa gaagaagagg aaggtgagac gagttttgaa 540

aaagaacctg gtagtgaaac catttctggc ccatttggag aagaacgatc atttgaagaa 600

cctcctccac aacaagaagt c 621

<210> 240
<211> 607
<212> DNA
<213> Candida albicans

<400> 240
aactagggct gctaatgttg ccactgaatt aactgctgct gcaccttatg aattgggtaa 60

attatattat aatggatttg aagatattgt cttgattgat aaaaaatatg gattagaatt 120

atttgctcaa gcagcagcat taggtcattt acaatcagcc gccattttgg gtcatcatta 180

tgaaattgga gaaattgttc ctcaagattc taatttatca attcattatt atactcaagc 240

agcattagga ggtgatccaa attcaatgtt ggcaatgtgt gcttggtatt tagttggtag 300

tgaaccatat ttacctaaag atgataatga agcatttgaa tgggctaaac gtgctgccaa 360

ttgtaattta ccaaaagctc aatttgcttt agcaaatttt tatgaaaaag ggattggatg 420

tattaaaaat attaatgaag ctcaatcatg gtataaaaaa gctgctgaaa atggtgatga 480

aaaatctttg aaacgattaa ctgataaaga attggttaaa accattcaaa aacaatggaa 540

aaagaaacct ccagtaattc ataatgaaga tggaacttct acaactaatt caggatctct 600

tgctcaa 607

<210> 241
<211> 693
<212> DNA
<213> Candida albicans

<400> 241
agtcagagca gggtcaatca tcaaaatcag atgtgatcaa gatttcgata gtgaaaaaga 60

agaggcagag aaatttacca aaattcagga tgagatttta caaacatttg ctacaaattt 120

gccacaacca ccaaatttga aaatcaagaa cgttactcaa acctcgtgtg ttttagaatg 180

ggataaacta aacttgggca ccgccacatt gaaaaatctt attttattca aagatggtaa 240

aaaattaggc tcaattcctc agccattaaa taatcgaacc tcaaaattgt ctggattgcc 300

aattgacaaa tcttttaaag tacaattacg tttggatacc actgctggta ctttcttgtc 360

gaatgaaatt gaggtaacaa cccacaaaat gactgatttg tcaggaatta ctgtgtgtct 420

tggtgacctt acacctaatg atcaattcaa caaggaggac attgaagagg cattaaagaa 480

tatgggggca aaatatccag tgcaacaaca agtcaaagtc gacactacac atttcctctg 540

tactagagaa aacaaacaaa atcctgaata tgtgaaggca aatgatatga acattccaat 600

aattagacca gagtggttga aagcctgtga gagagaaaga agaatagttg gtgttagaga 660

cttttatgtg aaagattgtg tcttacccga cat 693

<210> 242
<211> 511
<212> DNA
<213> Candida albicans

<400> 242
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tttcttccga ctcagaagca gttcaatttg caggaacatt atggaataaa tttggaggtg 120

ggaaagactc agaaagacct tttgacgatg caattgttga tgggtttgat tttgatattg 180

aaaataaaga ccagacaggt tatgctgctt tagcgactca attaagaaaa tattttagca 240

ctggaactaa atcttattac ttgtcagctg ctccacaatg cccataccct gatgagtcgg 300

ttggtgactt aatgtcccaa gttgatttag attttgcatt tatacaattt tataacaact 360

actgttcgct caatcagcaa ttcaactgga actcatggag caactatgcc agaggtaaaa 420

gtattaaact ttatttgggc cttcctggct catcatcgtc tgctggctcc ggatttgttg 480

gtttgtcgac tgttcaaaga gtcgtggcta g 511

<210> 243
<211> 510
<212> DNA
<213> Candida albicans

<400> 243
ctgtcaagaa actgacgttg acattgtttt attgtcattc ttgaatttgt ttccagatcc 60

attgaacgtt aattttgcca accaatgtgg taacactttt gaatctggtt tgttacactg 120

ttctcaaatt ggtgctgaca tcaaaacttg tcaatcttta ggtaaaaccg tgttgttatc 180

tttaggtggt ggtgttggtg actatggttt cagcgatgtt gcttctgcca ctaaattcgc 240

agacaccttg tggaacaaat tcggtgctgg tgaagatcca gaaagaccat ttgatgacgc 300

tgttgttgat ggtttcgatt ttgacattga acacggtggt gctactgggt accctgaatt 360

ggctactgcc ttaagaggca agttcgccaa agacacttcc aaaaactatt tcttatctgc 420

tgctccacaa tgtccatacc ctgatgcatc tcttggtgat ttattatcca aagtcccact 480

tgattttgca ttcatccaat tctacaacaa 510

<210> 244
<211> 577
<212> DNA
<213> Candida albicans

<400> 244
ttggctcgat taagaaataa attaaattca aaatatatta tcacggtagc ggctcctggt 60

ggtagtgata atattgaaat tttgaagatt caagaaatgg ataaatattt gacattttgg 120

aatttaatgt gttatgattt tgctggtgaa ggctggtctt cgaaaactgc tttccattct 180

aatttatttg gtaataatgg ggataattca ttgaatgcat ctgatgttgt ccaaacttat 240

attaacaagg gagttcatcc aacaaaattg atattaggga tgccaatgta tggaagaata 300

tttcatggtg ttgatcgacc agaaattggt attcctttta caaaagagag aaaatcaggt 360

tgtatagaag ctgatgttgt ggactataac aaatttggtg atacattcga ttatgaagat 420

tttgatccac gcaaagtggg tgcattgaaa tatgattccc atagtaagca attaattaca 480

tttgataatc cccagtgtgc tagaataaaa gctagctttg tacaactgag acaattgggt 540

ggtgggatgt ggtgggattc tgctggtgat gtttcag 577

<210> 245
<211> 909
<212> DNA
<213> Candida albicans

<400> 245
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tcagttgttc catcacaatc agccaacaat tcatctgctt cagctgctcc atctaacaac 120

tcatctagtg ctatttctgg aagtgttgca ccatcaagct acggaaactc taccattgca 180 caaccatcta cttctacaaa atccgatgct gcatcaatta ctggtccaat tactacagac 240

aaggttataa ccaatgagtc tggcattgtc tttacatcta cagtaatcat tacacatgtt 300

tctgaatatt gtgaccagac ttctgctgct gctgttcaat catcagcatg tgaagaacag 360

tcaagtgcta aatcagaaca agcttctgct tcatcagaac aagttaaggt cattactagt 420

gtggtttggt gtgagtcatc tattcaatct attgaatctg tcaaaacaag tgcagaagct 480

gctcataaga ctgaggttat tgctagttgt gcaagtgaat taagctcttt gagttctgct 540

aaatctgaag ctatgaagac tgtttctagt ttagttgaag ttcaaaaatc tgcagttgcc 600

aaacaaacct cgttggctgc tgtacaatca tctgctgctt ctgtacaatt aagtgctgct 660

cacgcccaaa agtcgtctga ggcagttgaa gttgcccaaa ctgctgttgc tgaagcttct 720

aaagctggtg atgaaatttc gactgaaatt gttaacatca ccaagacagt ttcttctggt 780

aaggagactg gtgtttccca agctactgtt gctgctaaca cacattcagt tgctattgct 840

aatatggcaa ataccaagtt tgccagcaca atgtcgttgt tggtcgctag tttcgtgttt 900

gttggtctc 909

<210> 246
<211> 537
<212> DNA
<213> Candida albicans

<400> 246
gacactccgt cagattcaac tccaactaaa aaaccagaac cgactataag tccagagttt 60

agaaaaccca gcataagtct gttaacttct ccaagtgttg cacataaacc tccgccacta 120

ccaccgtcac tgagtctggt tggaagtagt gagcattcga gtgcaagatc gtccccggct 180

atcacgaaga gaaactcgat tgcaaacatt atcgatgctt atgaagaacc agctactaaa 240

actgaaaaaa aggctgagct aaactcacca aagataaacc aactgacacc ggtgccaaag 300

cttgaggaac acgagaatga tacaaacaaa gtagaaaagg ttgtggatag tgcacctgaa 360

ccaaaaccaa aaaaggagcc tcaaccagtt tttgacgacc aagacgatga cttgacaaaa 420

atcaaaaagc tcaagcaatc taagaaacca cgtcggtatg aaacacctcc aatttgggcc 480

cagaggtggg ttcccccaaa tagacagaag gaggaaacta atgttgatga cgggaat 537

<210> 247
<211> 561
<212> DNA
<213> Candida albicans

<400> 247
acatagtcag ccacaaccac aaccacaagc aacacaacca agatcaaata gaagtagact 60

gcaaacgagc ttttctaaac caagaggtag caggcaagtt agtggcagtg gcaggtcaac 120

cggggccaag aaacaatcag caatcacact gggcagtact ggtactggcc ctgcccgaaa 180

tgctgataca ggtatgacat cagttgctaa tagcacttcc acaaccacta tgacaaccac 240

caacaataac aacaaattgt ctgtttcagc cccagtaaat gtgatatatg ctaatcttcc 300

tgagagactt caacaggtgt taccagcacc gccgttatca cgtgctccag taagacctga 360

tgtaacggtc aatttgacat caaaacgagc caaaagaaaa tcaaaattca ctccggaaca 420

agatgacatg atcgtgaatt tgaagaaaaa ggggaaatca tgggttgaaa ttgccgaaat 480

cactggtgtt ggatcatatt tagcggcacg gaatcgattt caagttattg ttggacagca 540

aggaaataac aattcgagtg c 561

<210> 248
<211> 351
<212> DNA
<213> Candida albicans

<400> 248
tcaagaaagc tactgatggt ggtccacacg gtgctatcaa tgtctctgtt tctgaaaaag 60

ccattgacca atctgttgaa tatgttagac cattaggtaa agttgttttg gttggtttac 120

cagctcacgc taaagtcact gctccagttt tcgatgctgt tgtcaaatcc attgaaatca 180

aaggttctta cgttggtaac agaaaagaca ctgctgaagc tattgacttc ttctccagag 240

gtttaatcaa atgtccaatc aagattgtcg gtttatctga cttgccagaa gtcttcaaat 300

tgatggaaga aggtaaaatc ttgggtagat acgtcttgga caccagtaaa t 351

<210> 249
<211> 707
<212> DNA
<213> Candida albicans

<400> 249
ctcagtcctt tgctacaacc actacagtta ctgctcctcc aggtggtacc gatactgtga 60

ttatcagaga gccaccaaac catactgtca ctactactga atattggtca caatcctttg 120

ctactactac tactgttact gctcctccag gtggtactga ctcagtaatt atcagagaac 180

caccaaatcc aactgtcact acaaccgagt attggtctca atcctttgct actactacta 240 cagttactgc tcctccaggt ggtactgact cagtaattat cagagaacct ccaaacccaa 300

ctgtcaccac cactgaatat tggtcccaat cttacgcaac cacaactact gtgactgctc 360

ctccaggagg cactgactca gtaattatca gagaaccacc aaaccacact gtcactacta 420

ctgaatactg gtcacaatca tatgccacca ctaccactgt aactgcacca ccaggtggta 480

ctgacactgt tatcattaga gagccaccaa accacactgt cactactact gagtattggt 540

ctcaatcgtt tgctactacc acaactgtaa ctggtccacc aagtggcact gatactgtta 600

tcattaggga accaccaaac ccaactgtca ccactactga atactggtct caatcatatg 660

caaccactac taccattacc gctccacctg gtgaaactga taccgtt 707

<210> 250
<211> 586
<212> DNA
<213> Candida albicans

<400> 250
aacggtcata tccaaagaag ttactggtgt tttcaaccaa ttcaattcat tgatatggtc 60

ttacacatac agagctcgat acgaagaaat atctactctt accgctaatg ctcaattgga 120

atgggctttg gatggtacta ttgccagtcc cggtgataca tttacattag tcatgccctg 180

tgtatataaa ttcatgacgt acgaaacctc agtgcaatta actgccaact ctattgcata 240

tgccacatgt gactttgatg ctggtgaaga cactaaaagt ttttcaagtt tgaagtgtac 300

ggtgactgat gagttgacag aagataccag cgtttttgga agtgttattt tgcctattgc 360

tttcaatgtt ggaggttccg gatctaaatc tacgataaca gactccaaat gtttttcaag 420

tgggtacaac actgtcacgt tttttgacgg aaacaatcaa ctttctacaa ctgcaaattt 480

tcttccccga agagaactag cgtttggtct agttgttagt caaagacttt ccatgtcgct 540

cgatacaatg actaattttg ttatgtctac accttgtttc atgggt 586

<210> 251
<211> 692
<212> DNA
<213> Candida albicans

<400> 251
aacattagaa acggaacagg ccgtcctcgt aagactccca gatccaagct ctatatggtt 60

taccccccac tttcaggtga ggactcaaca aatcctgaac cagaagaggg tagttcacag 120

gaaaacaatc ccacagaacc tagttcctca caatcaaatt cagtacaaaa tcaagaccaa 180 agtgaagacc agagtcaact accacaacaa gaactgaata cacaacaaga gctgaataca 240

caacaagaac tgaatacgcc atcacccagg gcgtcaaaca catcaactga aactcctgct 300

cctttaagtc ccatacaacc aggaattcga aatattcctc tgggattatt attaccacaa 360

gaaaaagttg gccgtcttat gggatatcca ttttaccgcg attttaattt taccctaaat 420

ccagagagat atcagaaact tatttatgtg tttcagatac ttaaaaatgc tgctcgtaat 480

cacagaaatg gagcttctct acttagaaag tatttcctgt tagcgagaag gtctaaaaga 540

acaacagaca tgtttgtaac caccatagag gaaatgcgga agaggctgtt ggaaaatagt 600

cgtaagagag agctcgagga agcgcaagaa agggaagagt caaataaaag acaacataca 660

gaatcaagtg cagaaccaaa tgcagaactg ag 692

<210> 252
<211> 506
<212> DNA
<213> Candida albicans

<400> 252
caaagttcca ccatttcaac tccagtagac tcattaccta caagtggaag aagtactcct 60

aatccgaatg catcaaccac ttcattaaca tcattgaata ctgctcttgc taaattaaat 120

gtttccaata ttccatttga agaaaatttg agtaatattg agaaagccgg taagatagct 180

gagattagac ccgaagtgga aaccattgtt aagataattg atgaacaaga agatttatgc 240

attattaatg aatggaaatt gaatgaaatt ttgaaatctt tattgaaacc taaaagtcct 300

gcattagtta aagaaggagc tttattaatc attcaacaat tggcaactaa atttggtggt 360

caaacccccca aagaagctta tttattacag tttttaagta ctgcttatga tatgtttact 420

gataaagata aaaatgttgt taaagctgct aaatctgcta ctgatgcatt atttggaatt 480

taccctgtgg aagcattagg atcaat 506

<210> 253
<211> 520
<212> DNA
<213> Candida albicans

<400> 253
atcgacatca acaggcttac cacctaattg gacgattaga gtatccagat cccataacaa 60

agagtatttc ttaaaccaat ctaccaatga gtcgtcttgg gacccacctt atggcactga 120

caaagaagta ttgaatgcat acattgcgaa gtttaaaaac aatggttaca agccacttgt 180 gaatgaggat ggccaggtta gagtttctca tttgttgatc aagaacaatc aatcaagaaa 240

acccaagtct tggaagtccc cagatggtat aagtagaact agagacgaat ctatacagat 300

attgaagaaa catttggaaa gaatattgag tggtgaggtt aaactaagtg aattggcaaa 360

taccgaaagt gattgcagct cacatgacag aggtggtgat ttagggtttt ttagcaaagg 420

acaaatgcaa ccaccattcg aagaagccgc attcaatttg catgttggag aagtcagtaa 480

cataattgaa accaatagtg gtgtccatat cctccaaaga 520

<210> 254
<211> 507
<212> DNA
<213> Candida albicans

<400> 254
caatagcaca ggcacaatct ggaactggta aaactgctac tttttctatt ggtatgcttg 60

aggttataga tactaaatca aaagagtgtc aagcacttat cttgtctcct actagagagt 120

tggcaattca aatacaaaat gtggtcatgc atttaggaga ttatatgaac attcacaccc 180

atgcctgtat tggtgggaaa aatgtcggtg aggatgttaa gaaattgcag caagggcaac 240

aaatagttag tgggacacca ggtagagtga ttgatgtgat aaaaagaaga aatctacaaa 300

ctagaaatat caaggttctt attttagatg aagctgatga actttttaca aaagggttta 360

aagaacagat ctacgaaatc tacaaacatt taccaccttc ggttcaagta gtagttgtta 420

gtgccacttt gccacgtgaa gtattggaga tgacaagtaa gtttaccact gatccagtga 480

aaatcttggt gaagagggat gagattt 507

<210> 255
<211> 535
<212> DNA
<213> Candida albicans

<400> 255
ttcattcaaa ccagccttac cacaagataa actcacgggt gtagatgata tccctgatag 60

agaacttacc gatattgaaa gaatcaacat caatgctgcc aattccaatt tacaaagaaa 120

attgaaaaca agacatttac aaatgatcgc tattggatca tctataggaa ccggtctttt 180

cgttggtact ggtggtgcat taagtactgg tggaccagct gccattgttc tagcatgggc 240

cataagtgct atatcggtat ttatgacaat gcaaggatta ggtgaattgg ccgttgcatt 300

cccagtttct ggtggattca atttatacgc aagtaaattt ttagaaccag gtattggatt 360 tgctgttggt tggaattatt tcttacaatt ctttgtatta ttgccattag aattagttgc 420

tggtgctata actatcaaat attggaatgc tagtataaat tctgatgtgt ttgttattat 480

attttggttt gtggtgcttg tgatcaccat gttgggtgta agatggtatg gtgaa 535

<210> 256
<211> 433
<212> DNA
<213> Candida albicans

<400> 256
cacaaggtta tacattcaga aaactaaaac ttactgatta tgataatcaa tatttagaaa 60

ctttaaaagt tttgacgaca gttggtgaaa tttccaaaga agatttcact gaattgtata 120

atcattggtc ttcattgcca tctatttatc atccatatgt aatcaccaat gcatcaggta 180

tagtggtagc cacggggatg ttatttgtgg agaaaaaatt gattcatgaa tgtggtaaag 240

ttggtcatat tgaagatatt tcagttgcta aatctgaaca aggtaaaaaa ttgggatatt 300

atttagtcac ttcattaacc aaagttgctc aagagaatga ttgttacaaa gtcattttag 360

attgttctcc tgaaaatgtt ggcttttatg aaaaatgtgg ttataaagat ggtggtgttg 420

aaatggtatg tag 433

<210> 257
<211> 540
<212> DNA
<213> Candida albicans

<400> 257
aaaccataaa tcaacaacca cttgcttcgt caagatgggc tgcttgtgcc attggtggtg 60

ttcttgcttc atttattcaa attcttgcca cacttttcga atggattttc gtgcctagag 120

aatgggccgg tgctcaacat ttgagtcgtc gtatgctatt tttggtgtta attttcttac 180

tcaatttggt tccaccagtt tatacattcc aaattaccaa attggtgatt tattcgaaat 240

cggcatatgc tgtgtcgatt gttggatttt tcattgctgt ggccacttta gtattctttg 300

ccgtcatgcc attgggtggt ttattcactt catacatgaa caagagatca agaagatata 360

ttgcatcaca aacatttact gccaactaca ttaaattgaa aggtttagat atgtggatgt 420

cttatttgtt atggtttttg gttttccttg ccaaattggt tgaatcttat ttcttctcga 480

ctttgtcttt aagagatcct attagaaact tgtcgaccat gacaatgaga tgtgttggtg 540

<210> 258

<211> 574
<212> DNA
<213> Candida albicans

<400> 258
tattatggcg attccacaga gttgatattg gtgatatcac aaatatggaa cagcattatc 60

atttccatgt acagggagca tgttctctcg gttgaacaag tttgcaagtt gatttatcaa 120

cgaggagctg atgaaaacac tatacgacca ccactatttt ttgtttacga agatgataac 180

aaattttatg attttattaa aatcgaaaag gaatgggaaa gaaggatcac atttttttgct 240

caatcgttat caagcccttt accagaacca tttccagtag tttctacacc aacatttacc 300

gttttgattc ctcattactc agaaaaaata ctattaagtt tacaagattt aattaaagaa 360

caaagctttt caaaactaac gttgctagat tatttgaaac aacttcattc gaaagaatgg 420

gattcatttg ttcaagatag taagatgatc caaactataa aggaaatgga tgaagacaag 480

tttgtacgcg aaaatatgga tgatttgccg tactactgta tcgggttcaa agattcttca 540

ccagaaaatg ttttacgaac aagaatttgg gctg 574

<210> 259
<211> 506
<212> DNA
<213> Candida albicans

<400> 259
cgtttgttat ttgctgttcc taaaaagggc agattatacg aaaaatgctg taacttattg 60

agtggtgccg atatacagtt tagaagatct aatagattag atatagcact ttctacaaac 120

ttgccaattg cattaatctt cttgcctgca gctgatatcc cagttttcgt tggagaaggt 180

aattgtgact tgggtataac tgggttagac caaatcaaag aagctgaaca attcgacaac 240

atcgaggact tgttggattt gaaatttggt tcatgcaaat tgcagatcca agttccagca 300

gatggcgagt acgaaaagcc agaacagctt gttggaaaga aaattgtgtc ttcatttaca 360

aaattgagta ccgactattt caaacaattg tcagacaaac ctactaatat cagatatgtc 420

ggtggttccg ttgaggcttc ttgtgccttg ggtgttgctg atgctattgt cgatttggtt 480

gaaagtggtg aaactatgaa agcagc 506

<210> 260
<211> 539
<212> DNA
<213> Candida albicans

<400> 260
agctaaatcc aaagacgatg acgcatcggc atatgtcggt gtcgggtcca tcgctgctgg 60

tggccgttac gacaatttag tgggtatgtt ctccaacggt aaatccatcc cttgtgttgg 120

tgtatcgttt ggtgttgaga gattattctc catcatcaag aaccgtgcca atctcaacaa 180

catctccgcc aaccacactg acgtgtttgt tatggcattt ggcggcggcg aaggctggaa 240

cgggttctta aaagaaagaa tggaaatcac caacaagtta tggaaagctg ggatcaacgc 300

cgagtacttg tacaaatcca aagccaacat tcgtaaacaa ttcgatgccg ccgaaaaggc 360

cggcgccaaa ttagctgtca ttcttggtaa agaagagtac ccacaaggcc aattacgaat 420

caaagtgttg ggccagggag aggaaaacga aggtgagttg gtcaccaaag atgaactact 480

tgctgctgtc caggccaagc tcagctctga catcgacgac atttctcgca taatcaagg 539

<210> 261
<211> 1030
<212> DNA
<213> Candida albicans

<400> 261
gctaccactc caaacacttc tgttccaaca acttcttcag aatcaactac tccagctact 60

agcccagaaa gttctgttcc agttacttct ggatcatcta ttttagctac cacttcagaa 120

tcatcatctg ctccagctac tactccaaat acatctgttc caaccactac tactgaaacc 180

aaatcatcaa gtactccatt aactactact actgaacatg atacaactgt tgtcactgtt 240

acttcatgtt ctaacagtgt ttgtaccgaa agtgaagtta ctactggtgt tattgtcatc 300

acatctaaag atactattta caccacttac tgtccattga ctgaaactac tccagtttct 360

actgctccag ccactgaaac accaactggt acagtatcca cttctactga acaatcaact 420

actgttatta ctgttacttc atgttctgaa agctcttgta ccgaatctga agttactact 480

ggtgttgttg ttgttacttc tgaggaaact gtctacacta cattctgtcc attgactgaa 540

aacactccag gtactgattc aactccagaa gcttccattc cacctatgga aacaattcct 600

gctggttcag aatcatccat gcctgccggt gaaacctctc cagctgttcc aaaatcagat 660

gttccagcta ctgaatcagc tccagttcct gaaatgactc cagctggttc acaaccatct 720

attcctgccg gtgaaacctc tccagctgtt ccaaaatcag atgttccagc tactgaatct 780

gctcctgctc ctgaaatgac tccagctggt actgaaacta aaccagctgc tccaaaatca 840

tcagctcctg ccactgaacc ttccccagtt gctccaggta ctgaatccgc accagctggt 900 ccaggtgctt cttcttctcc aaaatcttct gttttggcta gtgaaacctc accaattgct 960

ccaggtgctg aaaccgctcc agctggctca agtggtgcta ttactattcc ggaatctagt 1020

gctgtcgtct 1030

<210> 262
<211> 528
<212> DNA
<213> Candida albicans

<400> 262
ttggtgggtt agaagttgag aaaggtgctt ctttatttat taagctggac aatggtcctg 60

tcttagctct taatgtcgct ttatcaactt tagttagacc agttataaat aatggtgtta 120

tttcattaaa ttctaaatct tctacaagtt tttcaaattt tgacattggt ggatcttcat 180

tcactaataa tggtgaaatt tatcttgatt cttcgggtct tgttaaaagt acagcctatc 240

tttatgcacg tgaatggact aataatgggt taattgttgc ttatcaaaat caaaaagctg 300

ctggtaatat tgcttttggt actgcttatc aaaccatcac taataatggc caaatttgtt 360

tgcgtcatca agactttgtt ccagctacaa aaatcaaagg tactggttgt gttactgctg 420

atgaagacac atggattaaa cttggtaata ctattttatc agttgaacct actcataatt 480

tttacttgaa agatagtaaa tcgtctttga ttgttcatgc tgtttcaa 528

<210> 263
<211> 528
<212> DNA
<213> Candida albicans

<400> 263
caagagaaag ggaaagaaga gaaaaaggac acagcctttc aaacatcttt tgatagaaat 60

tttgatcttg ataattcaat cgatatacaa caaacaattc aacatcagca acaacagcca 120

caacaacaac aacaactctc acaaaccgac aataatttaa ttgatgaatt ttcttttcaa 180

acaccgatga cttcgacttt agacctaacc aagcaaaatc caactgtgga caaagtgaat 240

gaaaatcatg caccaactta tataaatacc tcccccaaca aatcaataat gaaaaaggca 300

actcctaaag cgtcacctaa aaaagttgca tttactgtaa ctaatcccga aattcatcat 360

tatccagata atagagtcga ggaagaagat caaagtcaac aaaaagaaga ttcagttgag 420

ccacccttaa tacaacatca atggaaagat ccttctcaat tcaattattc tgatgaagat 480

acaaatgctt cagttccacc aacaccacca cttcatacga cgaaacct 528

<210> 264
<211> 360
<212> DNA
<213> Candida albicans

<400> 264
cgttaactca gtcatatact acattttatt cctttttgca tcaacaatcc ttgcggcaga 60

taaaacgtcc agttcagtat cacctacttt agtatgggtc acaggtactg atgccaatgg 120

gaaattagcc accacccaat caacatatta tcaaagcttt atgagtactt ataccacagc 180

tgaaacccca tcgtctggtt ctattggatt ggggtcaatc agtggaacag taggagaaat 240

cagaacttat agtatgacta ctatatcaca aggtaatggt gggttatcaa aattcaatca 300

aaatggttta gaaatgaaga atttgtcatt tgttaaatta attggggttt cttttattgc 360

<210> 265
<211> 701
<212> DNA
<213> Candida albicans

<400> 265
gatccagatg ctgtaaccac agccaatgga acattaaatt tacgtatgga tgcttataaa 60

aatcataatt tattctatcg ttcaggaatg gtacaaagtt ggaatcaatt gtgttatact 120

caaggtcatt tagaaattct ggctcgttta ccaaattatg gtaatgtaac agggttatgg 180

cctgggttat ggtctatggg gaatttaggt agaccagggt atttgggatc tactgatggg 240

gtatggccat attcttacga ttcatgtgat gccggtatta cacctaatca atcttctcct 300

gatgggattt cttatttacc aggtcaaaga ttaaataaat gtacatgtcc aggtgaatta 360

catcctaatc gaggtgttgg tagaggtgcc cctgaaattg atgttattga aggtgaagtg 420

atgactgata gtagtggtaa aaaagaaaat tgtggtgttg cctctcaatc cttacaattg 480

gcccctatgg atatttggta tattcctgat tataattggg tggaaatcta caatttttca 540

gtttcaacga tgaatactta tactggtgga ccattccaac aagcattatc agcaacaacc 600

atgttgaatg ttacatggta tgaatttggt gataatgccc ataatttcca aacttatggt 660

tatgaatatt taaatgaccc tgaaacgggt tatttacgat g 701

<210> 266
<211> 794
<212> DNA
<213> Candida albicans

<400> 266
taatttccct tgttgtttcc ataataagat gtgttgttgc agatgttgac atcacatcac 60

caaagagtgg agaaactttt tctggtagtt ctggatcagc aagtatcaag attacctggg 120

atgattcaga cgattcagac tcaccgaaat ctttggataa tgccaaaggg tacacaattt 180

ctttatgtac tggacctact tcagatgggg atatccagtg tttggatcca ttagtcaaga 240

acgaagctat tgcaggtaaa tctaaaacag tttctattcc ccagaactca gtacctaatg 300

gttattacta tttccaaatt tacgttactt tcactaatgg aggtaccact attcattatt 360

caccacgttt caaattgact ggtatgtctg gtccaactgc cactttagat gtcaccgaaa 420

caggatcggt gccagcggat caagcttcag gatttgatac tgcaactact gccgactcca 480

aatctttcac agttccatat accctacaaa cagggaagac cagatacgca ccaatgcaaa 540

tgcaaccagg taccaaagtg actgctacaa cctggagtat gaagttccca actagtgctg 600

ttacttacta ctcaacaaag gctggcacac caaatgtggc ctctactatt accccaggtt 660

ggagttatac tgctgaatct gccgttaact atgctagtgt tgctccatat ccaacatact 720

ggtatcctgc cagtgaacga gtgagtaagg ctacaattag tgctgctaca aagagaagaa 780

gatggttgga ttga 794

<210> 267
<211> 654
<212> DNA
<213> Candida albicans

<400> 267
acattcattg ggttcatctc cagaaaacaa taatgccctg ggtccattaa gtggagttcc 60

aactccatca ttttctaatt tgaatgatta tttccaacaa aaaagtaaca gcaataattc 120

tcgattattt aatgctagtt catcatcatt gagttcatta agtggaaaaa taagatcttc 180

ttcatcgact aatttagctg gtttacaaag attaactcca ttaactagta ctacaaacaa 240

tacaaacaac acaacaacat ctaatactaa taataataat atgacaaaac caagtataat 300

accaaaacaa ccatcttcta catcattaaa tttagaattt tataatggca acaatcaaca 360

acaacagaat tatcataccc ataagaaatc tcgaccaaat tcaccatcac aaaccccaat 420

tcatttatca agttcacgta aaagcgctaa taatctgttt ataatatcac ctaatgaaac 480

cccattacaa actccattac aatcaccaca attaaaacca tatcaagatc aaccaccaac 540

taatgtcaat atcaacgtta gtgcaccatc agatacattt attggaactg ctgttactga 600 aaaattaaat aatattagta gtattgctgg taatggaaca caattaccac caat 654

<210> 268
<211> 529
<212> DNA
<213> Candida albicans

<400> 268
tgtcccagaa agtgctaaac acattttcaa ccaagaaact ttagcatttg ttgccacttt 60

gcaccgtggt ttcgaagcca gaagacaaga attgttgaac aacagaaagg aacaacaaaa 120

attaagagat caaggtttct tgccagattt cttaccagaa actgaataca ttagaaatga 180

tgctacctgg actggtccac cattggctcc aggtttagtt gacagaagat gtgaaatcac 240

tggtccaacc gacagaaaaa tggttatcaa tgccttgaac tccaatgttg ctacttatat 300

ggccgatttt gaagattcat tgaccccagc ttggaaaaac ttggttgaag gtcaagtcaa 360

tctttacgat ggtgtcagaa gaaacttgac tgctaacatt aatggtaaaa attatgcctt 420

gaacttggac aaaggtagac acattccaac gttgattgtg agaccaagag gatggcattt 480

ggatgaaaag catgtattgg ttgacggtaa accagtttcc ggtggtatt 529

<210> 269
<211> 647
<212> DNA
<213> Candida albicans

<400> 269
ttagctcatc aacatcatca acataaagaa gaaaaaagag ctgttcatgt tgttaccacc 60

accaatgttg ttgttgtcac cattggtaat ggtgatcaaa ctaccacttt tgctgctcca 120

tctgtagctg ctgattctag tgttagtgtt tctgtcaaca ctgaaccacc tcaaaatcac 180

ccaactacta ctcaagatgt tgcttctgct tctacttatc catcttccac tgatggttct 240

gccgcttctt cttctgctgc cgcttcttct tcttctcaag ctggttctga accttctggt 300

ggtgttggat ctggtggtgc taaaggtatt acttattctc catacagtga caatggtgga 360

tgtaaatcat catctcaaat tgccagtgaa attgctcaat tatctggatt taatgtcatt 420

cgtttatacg ggttgattg tgatcaagtt gcagctgtat taatagctaa aacttcatct 480

caaaaaattt tcgctggtat tttcgatgtt tctagtatta catctggtat tgaaagttta 540

gctgaagccg ttaaaagtat ttgcggtagt tgggatgata tttacactgt ctctattggt 600

aatgaattgg ttaatgctgg ttctgccact ccaagtcaaa ttaaagc 647

<210> 270
<211> 636
<212> DNA
<213> Candida albicans

<400> 270
actgtcgttt ctggtcattc tggtaaagat acttcctctt ctaaatcaac tgttgccgaa 60

tacactgggg ttgaagaaat cactaccacc ttgaattatg actatttagt tgttggtgtt 120

ggtgctcaac catctacttt cggtattcct ggagtcgctg agaattcaac ctttttgaaa 180

gaagtcagtg atgcttctgc tattagaaga aaattgatgg atgttattga agctgccaat 240

attttaccta aagatgaccc agaaagaaag agattattgt ccattgttgt ttgtggaggt 300

ggaccaacgg gtgttgaagc tgctggtgaa atccaagatt atattgacca agatttgaag 360

aaatgggttc ctgaagttgc cgatgaattg aaagtctcct tggtggaagc tttaccaaac 420

gttttgaaca catttaacaa gaaattgatt gactatacca aagaagtttt caaagacact 480

aatatcaatt tgatgactaa taccatgatc aaaaaagtca atgataaaag tttgattgca 540

aaccataaaa accctgacgg atctactgag tctattgaaa ttccatatgg tcttttaatt 600

tgggctactg gtaatgcacc aagagatttc actcgt 636

<210> 271
<211> 666
<212> DNA
<213> Candida albicans

<400> 271
ggtacgaaca gacaaacacc tgaagaaact gacattggta tgattgccca ttattttgaa 60

aaataccagt ttgacgggtt aattattgtt ggaggttttg aagcatttgt ttcgttagag 120

caattggaaa gatcaagagc tatgtatcca tcgttcagaa ttcctatggt tttaatccct 180

gccaccattt caaataatgt tcctggtacc gaatattctt taggggctga tacctgtttg 240

aattcgttaa tggaatattg tgacattgtc aagcaatcag cttcagctac cagaggtaca 300

gcatttatta ttgatgttca aggaggtaat tccggataca ttgccacatt tgcctcatta 360

atcagtggag cacaagcatc ctatgttcca gaagaaggta tttcattaca gcaattggaa 420

atggatatca attcattgag agaagcattt gccgtggaac aaggaatgac aaagagtggt 480

aaattgatca tcaagtcgag taatgcatcc aaagtactaa ccccacacac attggctgac 540

atattcaacg atgaatgtca cggtgacttt gacactaaga cagctattcc gggacacgtc 600 caacaaggtg gattaccttc accaatagat agaagcagag gtgatagatt tgccattaga 660

gctgtt 666

<210> 272
<211> 588
<212> DNA
<213> Candida albicans

<400> 272
ttagccaagt ttgaatcgtc caccccacca gttgaagttg ttggtaacaa attttatttt 60

tccaataatg ggtctcagtt tttaatcagg ggtatcgcct atcagcaaga tgccgcgggc 120

tcagtttcct ccggttacga cgccgatcct aatagaaaat acaatgatcc tttagccgat 180

gctgacgctt gtaaacgtga cgtcaagtat ttcaaagaat caaacaccaa tactttgaga 240

gtttatgcta ttgacccaga taaggatcat gaagagtgta tgaaaatttt cagtgacgct 300

ggtatttaca ttgttgctga tttatcagaa ccaactgtat cgattaacag aaacaaccca 360

gaatggaact tggatttata caaacgttat acaaaagtca ttgataagat gcaagaatat 420

tctaatgttt tgggattttt tgctggtaac gaagtaacta ataatcgttc aaataccgat 480

gcttctgcat ttgttaaggc tgccattaga gatatgaaga aatacatcaa ggagtctgat 540

tatagacaaa ttcctgttgg ttattcatcc aatgatgacg aagaaatt 588

<210> 273
<211> 609
<212> DNA
<213> Candida albicans

<400> 273
tcaatcttgg ctgctacttc attcgtttct tccgtggctg ccgaagattt gcctgctatt 60

gaaattgttg gtaacaaatt cttctactcc aacaatggat cccaatttta catcaaaggt 120

attgcttacc aacaaaataa cttggactcc aacgaatcat ttgttgaccc attagctaat 180

cctgagcact gtaaaagaga tattccatac ttggaagctg tcgactacga ctccaatgtc 240

atcagagttt atgctttaga caccagtcaa gaccatactg aatgtatgca aatgttgcaa 300

gatgccggta tttatgtcat tgccgatttg tcccaaccag atgaatccat caacagagac 360

gacccatcct gggatttgga tctttttgaa agatacactt ctgttgtcga tttgttccac 420

aactacacta acattttagg tttctttgcc ggtaatgaag tcaccaacaa gaaatcaaac 480

actgacgctt ctgctttcgt taaggctgct atcagagata ccaaagccta catcaaaagc 540 aaaggttaca gaagtattcc agtcggttac tctgccaatg atgattccgc catcagagtt 600

tcattagcc 609

<210> 274
<211> 684
<212> DNA
<213> Candida albicans

<400> 274
attgggtatc aacaccattc gtatttattc aataaatgca cacctaaacc acgataaatg 60

catgaccatg ttggccaaag caggaatata cttgtttcta gacgtaaact cgccattgcc 120

acaccaccac ctaaaccgat acgagccgtg gaattcgtac aacttgtact actttgaaaa 180

tgtctttaag gtggtagaac agttttccca ctacaacaac acgctagggt ttattgccgg 240

gaacgaaatt gtcaacgacc ccatctccgc cagtgtggct gccccatatg tcaaagcggt 300

ggtccgcgaa atcaaaagct atatcgaata caatgcacca agaaccatcc ccgtcggtta 360

ttcagcggcc gacgacttga actatcgaat gccactagca cagtacctcg agtgtggcga 420

cgacaacccc aaagaatcag tcgactttta tggcgtcaac tcgtaccagt ggtgtggcga 480

ccagacattc tacagcagcg ggtacaacat cttggtcaac gattacaaac atttcaccaa 540

accaatgttt ttttcggaat atgggtgcaa tgaggtgttg ccgagaaatt tcgatgaagt 600

cccagtattg tacacaaacg atatgataga tgttttcagt ggcggattgg tatacgagtt 660

cacccaggaa ccaaacaact atgg 684

<210> 275
<211> 532
<212> DNA
<213> Candida albicans

<400> 275
attagctgaa catgccagag accacacatt gagattcggt agcaaatcgc catttttcag 60

aaaatacttt ggaaatgaca ctgcaagtgc tgaggtcgtt ggtcattttg aaaatgttgt 120

cggtgctgac aaatcatcca ttttgtttct ttgtgatgac ttagatgata agtgcaaaaa 180

tgatggctgg gctggctatt ggagaggttc caaccatagt gatcaaacta ttatttgtga 240

cttatctttt gttaccagaa gatacttatc ccaactatgc tccggtggat ataccgtctc 300

gaaatctaag acaaacattt tttgggcagg tgacttgtta cacagattct ggcacttgaa 360

atcgattggt caacttgtta ttgaacatta cgctgacact tatgaggagg ttcttgaatt 420 ggctcaagaa aattcaactt atgctgtaag aaactcaaac tcattgattt attatgcttt 480

ggatgtgtat gcatatgatg tgacaattcc cggcgaaggg tgcaatggag at 532

<210> 276
<211> 506
<212> DNA
<213> Candida albicans

<400> 276
gatttacacg cctcacaaat tcaagggttt ttcgatgttc cagtagataa cttgtacgct 60

gaacctagtg tggttagata catcaaggaa actattgatt atagtgaagc tataattata 120

tcttctgatg ctggtggtgc caagagagct gctggattgg ccgatagact tgatttgaat 180

tttgaattga ttcataaaga aagagccaga gctaatgaag tatctcgaat ggttttagtt 240

gttgatgtca ccgataagat ttgtgttatt gttgatgata tggcggatac ttgtggtact 300

ttggctaaag ctgccgaagt attgttagat aataatgcta aagatgtcat tgccattgtc 360

actcatggta tattatctgg gaacgcaata aaaaatatca acaattctaa attgaaaaaa 420

gttgtatgta ccaacaccgt tccatttgaa gacaaattga aactttgtct taaattggat 480

acaattgata tttctgctgt tattgc 506

<210> 277
<211> 606
<212> DNA
<213> Candida albicans

<400> 277
taccacgata gctccatttc ccttagtggt tccaagaaca agagagaagc tgaaattgtc 60

aatgaagatg gtacaattga aaagagaact tttggaagcg ctggtgtaaa tgccggtttc 120

aatgccgcat ttgtcgtgtc taatgccaaa aaattatctg acggttctta tggtattgat 180

tgtaacttca agagtgattc ttctgtccaa ttgaacctgg cctttggtaa aaaagttaaa 240

caattgagta tcaccggtac tggttattct gatatttcat tattaggaaa tgttgctaat 300

ccatttgaat ggtcagcttc cttgaaagtc aaagcagaaa ttgttaaagg aaaatgttgt 360

cttccatcag gtttcagaat cgttacagat ttcgaaagca actgtcctga atttgatgcc 420

atcaaacaat tttttggcag ttctcaaata atttacaaag tcaatgccgt ttctaacgca 480

attggtactt ttgatgcttc tgcattattc aatgctcaag tcaaagcctt ccctgccaag 540

agagaattag atgaatttga agaattaagt aacgatggtg ttactcacag caagagaact 600 ttgggt 606

<210> 278
<211> 625
<212> DNA
<213> Candida albicans

<400> 278
gtggtgttac tgttggtgaa actgccaccg ttgctacaac tgttaccgtt ggtgcaactg 60

tcactggtgg tgaccaaggt caagatcaag ttcaacaatc agctgctcca gaagctggtg 120

atattcaaca atcagctgtt ccagaagctg atgatatcca acaatcagct gttccagaag 180

ctgaacccac tgccgatgct gatggtggta atggtattgc aattaccgaa gtctttacca 240

ctaccattat gggtcaagag attgtttatt ccggtgttta ttacagttat ggtgaagaac 300

atacctatgg agacgttcaa gttcaaaccc tcactattgg gggtggcggc ttcccttcag 360

atgaccaata tcctacaact gaagtttctg ctgaggctag tccatctgct gttactactt 420

cttctgctgt tgctactcct gacgccaaag tcccagactc tactaaagac gcttctcaac 480

ccgctgctac tacagctagt ggctcctctt ctggtagtaa tgactttagt ggtgttaaag 540

atacccaatt tgctcaacaa atcttggatg ctcacaacaa aaaacgtgct agacatggtg 600

ttccagattt gacttgggat gctac 625

<210> 279
<211> 220
<212> DNA
<213> Candida albicans

<400> 279
aagagatgat cctcatacta ttgaagcctt gagacaacaa caacaacaac cagtctcaac 60

ttctgaaggt caacaagttg ctcaaagaat tggtgctgct gattacttgg aatgttctgc 120

taaaaccggt agaggtgtta gagaagtgtt tgaagctgct actagagctt ctttaagagt 180

taaagaaaag aaggaaaaga agaagaaatg tgttgtcttg 220

<210> 280
<211> 531
<212> DNA
<213> Candida albicans

<400> 280
taagagagat ggccgtaaag agccagtacg tttcgacaaa atcactgcca gagttcaaag 60

attatgttac ggtttgaatc caaaccacgt tgaaccagtt gctattaccc aaaaagttat 120 atcaggtgtt taccaggggg ttactactat tgagttggac aacttggctg cagaaattgc 180

tgctacaatg acaacaattc acccagatta cgctgtctta gccgctagaa ttgccgtatc 240

aaatttacat aagcaaacca ccaaacagta ttccaaagtg tctaaggatt tatatgaata 300

cattaatcct aagactgggt tacactctcc tatgatttcc aaggaaacct acgacatcat 360

tatggaacac gaagatgaat taaactcagc cattgtttac gacagagatt ttaactacaa 420

ttattttggg ttcaagactt tggaaagatc atatttgtta cgtatcaacg gtaaggttgc 480

tgaaagacca caacatttga tcatgagggt tgctgtcggt attcacggta a 531

<210> 281
<211> 453
<212> DNA
<213> Candida albicans

<400> 281
ttttggacct caaatggacc agtatttgag agaaaaacta ttaagtgatg tggaaggtac 60

atgtacaggt caatttggtt acattgtgtg tgttttggat tcaatgaata tagatgttgg 120

caagggaaga ataattccaa gtactgggat ggctgaattt gaagtcaaat atagagctgt 180

tgtgtggaaa ccattcaaag gtgaagtggt agatgcagtt gtaacaaccg tcaataaaat 240

gggatttttc gccgatgttg gcccattatc agtgtttgtt agtacccatt tgataccttc 300

agatatgaaa tttaatcctt cagcaaaccc accagcatat gtgagtcccg atgaaaacat 360

tgaaaaggga tcgagggtta gattgaagat tgttggtaca agaactgatg tcaatgagat 420

ttacgccata ggaagcataa aagaagacta ttt 453

<210> 282
<211> 525
<212> DNA
<213> Candida albicans

<400> 282
ccaagaactt accattattg aacaaccact tcagaaagca ctggcaagaa agagtcagag 60

ttcactttga ccaagctggt aaaaaagctt caagaagaca atctagattg agaaaagctg 120

ccaagattgc cccaagacca atcgatgctt taagaccagt cgtcagagct ccaactgtca 180

aatacaacag aaaagtcaga gccggtagag gtttcacttt ggccgaattg aaagccgttg 240

gtattgctcc aaaatacgcc agaaccattg gtatctcagt tgaccacaga agacaaaaca 300

aatctcaaga aacttttgat gctaacgtcg ccagattaca agaatacaaa tctaaattag 360 ttatctttga caaaaagacc aaggcttctg aagttgcttc tttcgaacaa gttgatgtct 420

ctgccacctt cccagttgaa caaccagctc cagaatctgg tttgagagct gttgaagttc 480

cagaacaaac tgcttacaga accttgagat tggctagaaa cgaaa 525

<210> 283
<211> 400
<212> DNA
<213> Candida albicans

<400> 283
ttaaaggatt caaaaagggt gtccttaggg ccccacagac aatgcgtcag aaattcaaca 60

tgggagaaat cacccaagat gctgtttatc tcgatgctga aagaagattc aaagaaatcg 120

aaacggaaac aaaaaagttg agtgaagaat ccaagaaata tttcaatgct gtcaatggga 180

tgttagatga acaaattgat tttgccaaag ccgtggctga gatttataaa ccaatcagtg 240

gtagattatc ggaccccagt gctacggtac cagaagataa cccacaaggt attgaagcat 300

cggaactgta ccaagcagtg gttaaagatc tcaaagatac cttaaaaccc gatttggaat 360

tgattgaaaa aagaattgtt gaaccagcac aagaattatt 400

<210> 284
<211> 522
<212> DNA
<213> Candida albicans

<400> 284
catggcacca gaaagaacca ccaattataa cacccatcgt ttaatcaacc aattaattga 60

tatgaatcaa tatgagtcaa ttgaaatcaa tgggacaaca gtgacaaaat caaactgtaa 120

atatttacct acattggctg gggatatttg gtcattggga gtattgttca ttaatatcac 180

ttgttcaaga aacccatggc ccattgcatc atttgataat aatcaaaata atgaagtgtt 240

taagaattat atgttgaata ataacaaggc tgttttgagc aaaatcttac ccatttcctc 300

acaatttaat cgcttattag atagaatttt caaattgaat cctaatgata gaatagattt 360

accaacttta tacaaagaag ttattcgttg tgatttcttc aaagatgatc attactacta 420

tgcccaacat caacatcatc acaatcacaa tcaaatcaat aatgcttaca atcactatca 480

gaaacaacct aatcaagcaa gacctactgc aaaccaacaa tt 522

<210> 285
<211> 500

<212> DNA
<213> Candida albicans

<400> 285
tataatgccc cgaaaataaa gtttaccgat actgaaggac aagaagaaca tttttatttc 60

aatcggagta acaattcaac caatgattta accagtcatg actcttcatc aactcaacta 120

caagatgcca attccagaag acaagcccca ccaccaccac cacataatcc attttctgac 180

aattcccatg aaaatagtac tgaatcatta tatcaatcag aaacaagatt tcatcaacca 240

ctacttcata atgatagtaa taatagcaat agcagtatag gcaataatag acaacgtatt 300

ccatcacaac aacatgatac actgtcatta tattcagcat caccaatatc aacatcacct 360

ttagtttcta attttcaatc atatctggac aaccaagacg aaatgactcg aggtaagtat 420

aaccagaata caaatcggtc aagttcaaat tatattcaac acagtccaac atcagcaggg 480

tacgatagat atccgcttaa 500

<210> 286
<211> 279
<212> DNA
<213> Candida albicans

<400> 286
tggaacctgt ttgtacttga cgtcattgtc gaaaaaacac ccagagaaat tgtgtaaaga 60

gaaatacgtc cacggcggta acgtgttgat cgacccaact gccaagatcc acccatctgc 120

cttaatcggt ccaaacgtca ccatcggtcc aaacgttgtt gtcggtgaag gtgctagaat 180

ccgaagatca gtgttgttgg ccaactccca agtcaaagac cacgcctggg tcaaatctac 240

cattgttggt tggaactcca gaattggaaa gtgggctag 279

<210> 287
<211> 597
<212> DNA
<213> Candida albicans

<400> 287
gatttcctag ccggaatgca cgacaatcct gagacggaag tcgatcgtcg atgcccatgg 60

tgcgtggtga aaaattttct tagaaaattt gttctttcct tcaactgctt ttaagaaaga 120

gaggttcaag tggtttaagt acgacggtca caaagattgc ggcttatgag gcccgaactg 180

agttgaaata caaaatcaag atataattat ataccttact tgtccatatt gttttataat 240

acattcttca gatatttaaa tttctgtgta tcaacctata aaacagagat acattcagtg 300 catttagtat actgagtgaa ctggtacctg tgacattcaa gataactgtt tcgcgcacgc 360

tggcagacga acagattaga agcttggtaa agttctgctt tgctcaatag gtttcagatt 420

cagaaagatt gttaaaactt agatcatctt cgttcatcac aaaccaagaa ctttacggaa 480

tgtacgaata tcactttcat tagtagataa ttcgttactt aatccagtga ttaatcttga 540

ggttcgaaag atggttaata gaaatttatt tgacaattac gactaaggtt acataat 597

<210> 288
<211> 350
<212> DNA
<213> Candida albicans

<400> 288
aagacgactg agcgtgtccc ttttgtataa actttataat tttcaatgaa tcttttaccc 60

cattggtttc aacaccgcca ctaacatcgt agcccaaaat gttgtcaaat gtaggcaaat 120

tctcaggggt tagcccacca gcaagtatag cttttgtagg taacttctca ataaacgtcc 180

aatcaagtaa cttcccttca cccccaactt ccgaatcaag caacggcaaa ctcacacatt 240

gcgttaacag caagctctgc tcttccaaaa ggtctagctc gtcaggaaca acatacctgg 300

gaattaaccc aaattctgta cccaaaaact ctagcttatc ttccagtcca 350

<210> 289
<211> 330
<212> DNA
<213> Candida albicans

<400> 289
acatgtcaag aggattgttc atgtaagaat aatgaagccc ccacaacaaa gacaactgcc 60

accacaacta atgttggtga tggccctggc cctggcccta tccctggcaa taatgatgat 120

gatgatgatg acatttggtc agatgatgat acgaaactaa tacctgaaaa tgatataata 180

cgatcacatt ataaaaaagg gtatgttgat gggataactc aagctaaaga atcttcatta 240

caacaaggat ttgatgatgg atatcctgaa ggtgcaaaat tagggattaa agttggtgaa 300

attttagcaa atttaatcaa tcaatgtaaa 330

<210> 290
<211> 524
<212> DNA
<213> Candida albicans

<400> 290
gccgaagata ctaaaccaaa gactgaagaa tcatcttcta ttccaaaacc accaacttct 60

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aatgtattct ccatgtttgg tgccaaaaaa gagaaaaaac cagaacaaga agattcagac    120

aacaagaaag aatccgataa aaaggaagaa aaagatacta gcaaatcaac tggtgatgat    180

aatgaagtag ctgaagaaga agaagctgat gtcgaattta ctccagttgt tcaattggat    240

aaaaaagttg acgttaaaac caatgaagaa gatgaagaag tcttgtataa agttagagcc    300

aaattattta gattccatgg tgattcaaaa gaatggaaag aaagaggtac tggtgatgtt    360

aaatttttaa aacataaaac tactggtaaa gttagaattt taatgagaag agataaaact    420

ttgaaaattt gtgctaatca tttgatttct gctgattatg aattgaaacc aaatattggt    480

tctgatagat cttgggttta tactgttact gctgatgttt ctga                     524

<210>  291
<211>  513
<212>  DNA
<213>  Candida albicans

<400>  291
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gctcacactg gtgctactgc cattgctggt agattcactc caggtaactt taccaattat    120

atcactcgtt cattcaaaga accaagatta gttgttgtta ctgacccaag aaccgatgct    180

caagccatca aagaatcatc ttatgttaac attccagtta ttgccttgac tgacatggac    240

tctccatctg aatacgttga tgttgccatt ccatgtaaca acaaaggtaa acactctatt    300

ggtttaatct ggtggttgct tgctagagaa gtcttgagat taagaggtat tatcccagac    360

agaactaccg aatggtcagt tatgccagat ttgtacttct acagagaccc agaagaaatt    420

gaacaaaatg ccgtcgaaga agctaaaact gaagaagttg aagaagctcc agttgctgaa    480

gctgaaaccg aatggactgg tgaaactgaa gat                                 513

<210>  292
<211>  613
<212>  DNA
<213>  Candida albicans

<400>  292
tcgaccatac catccaatac ttgaatcatt ggaatttcaa accaatcaac atttaattca     60

agaatattct ttagatattg tcaatacttt atctcaattg gaatcactta cattagttaa    120

tcctgccatg attgatttac aaccagaaat tcaatggttt atgcgtccat ttttattaga    180

ttttttaatt gaattgcatt cttcatttaa attacaacca acaacattat ttttatgtct    240
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taatattatt gatagatatt gtgctaaaag aattgttttc aaacgtcatt atcaattagt 300

tggttgtaca gcattatgga ttgctagtaa atatgaagat aaaaaactgc gtgtacccac 360

attaaaagaa ttaacaataa tgtgtcgtaa tgcttatgat gaagaaatgt ttgttcaaat 420

ggaaatgcat attttaagta ctttagattg gtcaattggt catccaactt tagaagattg 480

tctacaatta gccattgatc tgaataattt atctaacaac accactaatg atattgaaaa 540

caaaagtgta cgtcctaatc ggaaatcaag tatatcatca gctgtaactg ctgttgctag 600

gtttctttgt gaa 613

<210> 293
<211> 251
<212> DNA
<213> Candida albicans

<400> 293
agaaatttgg cctgatgtta attatttacc agattttaaa tcaagtttcc ctcaatggaa 60

aaagaaacct ttgagtgaag cagttccaag tttggatgct aatggaattg atcttttgga 120

tcaaatgttg gtgtatgatc caagtagaag aataagtgct aaacgagctt taattcatcc 180

ttattttaat gataatgatg atcgtgatca taacaattat aatgaagata atattgggat 240

tgacaaacac c 251

<210> 294
<211> 564
<212> DNA
<213> Candida albicans

<400> 294
aacagcaacc agaaatcaag ttaggtatga gaccattgtt gttggatttc ttaatggaag 60

ttatcactat tctcaacttg tctagatcta cattcccttt gactgtcaat ttgattgatc 120

gttattgttc aaccagaatt gtcaagaaac aacattacca gttgttggga ttgactagtc 180

tttggatcag ttgtaagaac ttggattcaa agttcaaagt tcctacattg aatgatttga 240

gaaaaatttg tgttgacagt tattacaaag aattgtttgt ggaaatggag aaacatattt 300

taaaatcatt agaatgggtc gtcaatgctc cgacatttga tgcctttatt gatttgtatt 360

caaacttgtt gatttctaac agcagtaact ttgaggttgc aaacattatc aaaaaatcat 420

ctcataaaat aaaattgttt tccaattata ttggtgaatt gttccagttt tatccaaaca 480

tttattacga ttacacatcg tcacaaattg ctttgattgc tattttaatc acggtcttga 540 cgttgaagat tcctgttgat ttaa 564

<210> 295
<211> 580
<212> DNA
<213> Candida albicans

<400> 295
gctaccactt taaccgacac cggtgtatcc tcaggattga ataataccac ttctggtggc 60

ggcagtgata gtgcaacctc cacacacaac aacaatgagg catcgaccaa accaagtaat 120

ggcagtgaaa aatcgtcacc ggagtacact acaactgccc gcggtagaga tgagtttgga 180

ttccttaatg aagccacacc aagtcaatac aaagccaatt cagattatga agacgatttc 240

ccattggatt atatcaatca gaccactcaa aattctgaag attatattac tttggatgca 300

aattatcagg caggaagtta tgcaaatatg atcgaagaca attacgattc atttttggat 360

gcaacactat ttatacctcc aagtcttggc gtacctacag gtacagctgc gactgcaaca 420

acatcaaacc aagttgcctt caacgacgaa tacttgattg aacaagccca accaataagg 480

actccactac ccccaatatc atcatcaaca atatccggat tattacaacc aaaatcagct 540

gctaaattct tttcactaca gagtgctaat ggtggagaag 580

<210> 296
<211> 604
<212> DNA
<213> Candida albicans

<400> 296
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gtcaatattt gggtgatgtt tcaaatcaat acataacaaa tgctaaacca acaaataaaa 120

gaaaaccatt gggtggagac aatgcccctc tacaaaaaca acagcataga ccatctagac 180

caatacccat tgccagtgat aacaacaata atggtagtac cagtagcagt agcaacagta 240

gcaacaacaa taacaacgac gcaaatagac tagcatcttt ggcagttcca tctcgattac 300

cccaaaaacg acaagctact gaatcgtcga caaatttagt agagaaatta agagtaccac 360

aaccagaagt aggggaaaga agtcagtcat accataagaa atcacgttta attgattatg 420

aatggcagga tttggatgaa gaagataatg acgaccaatt aatggttagt gaatatgtta 480

acgaaatatt ttcgtactat tacgaattag aaacacgaat gttacctgat ccgcaatatc 540

ttttcaaaca aacattgtta aaaccaagaa tgagatcgat attggttgat tggcttgttg 600 aaat 604

<210> 297
<211> 735
<212> DNA
<213> Candida albicans

<400> 297
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tcgtaattac acaagtgctc ctagtggtgc cccatacct tccaattcta ccagtggacc 120

ttcacaacag ccaccactac caggtcaaca agcagtacct atcccaccac atgtatcgac 180

aatgcaacaa ccaactcctg ttcaggatac gttgaacgcc tcgagcactt ccactgtggg 240

gcaattccaa ccaccaggaa tcagaccacg agtaacaact accatgtggg aagatgaaaa 300

aactttgtgc tatcaagttg atgccaataa tgtgtcggtt gtcagaagag cagataataa 360

tatgatcaac ggaaccaaat tgctcaatgt ggcccaaatg acacgtggta gaagagatgg 420

gattttgaaa tcagaaaagg tgagacacgt tgtgaaaatc ggatcaatgc atttgaaagg 480

agtctggatt ccatttgaaa gagcattggc catggctcaa cgtgaacaaa ttgtggatat 540

gttgtatcct ttgtttgtca gagatattaa acgagtgatt caaaccggag taactcctaa 600

tgcagctgct gcaacggccg ccgccgctgc cactgccact tctgcttcgg ctcctccacc 660

tccacctcca cccgttgctg ctgctactac tactgctgct actgctattt ccaaaagttc 720

tagcggtaat gggaa 735

<210> 298
<211> 563
<212> DNA
<213> Candida albicans

<400> 298
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acaagaggct catcattcca acctccaaat tatcaacaaa cacaatcacc cgccgctcat 120

gaaaaacaga ccggtaatgt tgctgctgga ggtggtgctg gttcaggttc cgcaggagct 180

caagttccat taggcaaaaa tagaggtcca ataccaaaag caattatggg agctggtgaa 240

ggtggtagtg atgctccggt tcctcaacaa gatattcctg atagttatac cctcaatgac 300

aaaattaagg ctacatttgt cactttggcc cgtaactctg atttatattc tttagctgaa 360

tcaattagac acgttgaaga tcgtttcaat aagaaattcc attatgattg ggttttcctc 420 aatgatgaag aattcaatga tgaatttaaa gaaactgttg gtagtttagt tagtggtaac 480

actaaatttg gtttgattcc aaaggaacat tggtcatatc ctccatggat tgatcaagaa 540

aaagctgctt tagtccgtga aca 563

<210> 299
<211> 554
<212> DNA
<213> Candida albicans

<400> 299
cccaactaat tcagcatcac ttaaacagaa acaacgtcaa cagctaggaa ttaaatccga 60

gattggtgct tcaacatcag acgtatatga tccccaagtt gctagttatt tgagtgctgg 120

tgattcacct agccaatttg ccaacactgc ccttcatcat agtaatagtg ttggttattc 180

tgctagtgca gctgcagctg ctgcggaatt acaacaccgt gcagaattac aaagaaggca 240

acaacaattg caacaacaag aattacaaca tcaacaggaa cagttacaac aatatcgaca 300

ggctcaagca caggctcaag cccaggcgca agctcaaaga gaacaccaac agttacagca 360

tgcttatcaa cagcaacaac agctacacca attgggtcaa ctttctcaac agttggcaca 420

accacatttg tcacaacatg agcatgtcag agatgcgctc actacggatg aatttgatac 480

taatgaagat cttcgttcac gatacattga gaatgagatt gtaaagacat ttaacagtaa 540

agccgaattg gtac 554

<210> 300
<211> 503
<212> DNA
<213> Candida albicans

<400> 300
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caacaacacc aaactattct gaattgttag gtcaattagg ccagttgtct caacaacaat 120

cacagcaaca gcagcttcat catatacctc aacaacgtca acgaacccag agtcaacaac 180

tgcaacagca acctcaacaa actgcacatg gattggatca accagatgct gcagttattg 240

ctgcaattga agctagtgca gcagcagctg ttgcgtctca aggatcacct aatgtcactg 300

cagctgctgt agccgcatta caacacacac agggtaatga gcacgatgct caacaacaac 360

aagatcgtgg tggtaataac ggtggtgcta ttgattcaaa tgtcgatcca agtcttgacc 420

caaacgttga ccctaatgtt caagctcatg atcattctca tggattaaga aattcgtatg 480 ggaaaagaag tgggtttttg taa 503

<210> 301
<211> 724
<212> DNA
<213> Candida albicans

<400> 301
gtcctttcaa gtgtttgtgg agcaactgta acattatttt cgagactcca gaaattttgt 60

acgatcattt gtgtgacgac catgttggta gaaagtcttc gaacaatttg tcattgactt 120

gtctttggga aaattgtggc acaactacag ttaagagaga tcacattact tctcacttga 180

gagtccatgt cccattgaag cctttccatt gtgacttgtg tcccaaatcg ttcaagagac 240

ctcaagattt gaagaaacat tccaagactc acgctgaaga ccatccaaag aagttaaaaa 300

aggcacaaag agagttgatg aaacaacaac aaaaagaggc caagcaacaa cagaaattgg 360

ccaacaagcg agcaaactcg atgaatgcaa ctaccgcatc cgatttgcaa ttgaactact 420

attccggtaa ccctgctgat ggattgaact acgacgacac ctccagaaaa agaagatacg 480

aaaacaattc tcaacacaac atgtatgtgg ttaatagtat tttgaacgat ttcaacttcc 540

aacaaatggc acaagctcca cagcaaccag gcgttgttgg aacccgcagg ttctggctga 600

gttcacccac caagaggatg aaagccggca ctgagtataa cattgatgtg tttaacaagt 660

tgaatcattt ggacgaccac ttgcaccacc accaccctca acagcaacac ccacaacaac 720

aata 724

<210> 302
<211> 543
<212> DNA
<213> Candida albicans

<400> 302
ataacccaca taaggtctgg ttaccaggag aagaaatctc aggacaagtt gtattaattt 60

cgaaaaagaa tttggcaaat atagtcataa cgttgtcgtt ggtggggttt attaaaataa 120

atgcatcgtc acatctgaag ttgaggcctt tgaagcatac gttatttgat tatactatta 180

aaatctatgg taaagatgaa gaagaacaaa cagactcagc agagtttagt aatggacttt 240

tgaaaggcga acatgtgttt ccgtttattg taaagttgcc caataaaaga gtatatacgt 300

cgattgattt tgggaaaggt tccatcaact acattttgaa agcagctata ggaaactcgt 360

cgtcctatgt gatacctgcc tcgcccgaca atgccagtac tagcagttta acgaaaaaga 420 aaatactaca gaatcctagt cacacatcag aaaaagtcat aagtctagta aatccaatag 480

atgtttcgtt attgcctcga ccgaaaccaa agagattgat tctcaaagat ccacgaacta 540

gct 543

<210> 303
<211> 315
<212> DNA
<213> Candida albicans

<400> 303
tgactacgat gactactgaa gaaatattgg cttcttatcc acaaatcacc gctccaaccg 60

atcaaacagg ttacacatca aatttaacac ctgaacaaaa aaccacttta gatatattca 120

gacaacaatt aactgaattg ggttataaag acagattaga tgatgcatca cttttaagat 180

ttcttagagc aagaaaattt gatattcaaa aagctattga tatgtttgta gcttgtgaaa 240

aatggagaga agattttggt gttaatacca ttttaaaaga tttccattat gaagaaaaac 300

ccattgttgc taaaa 315

<210> 304
<211> 230
<212> DNA
<213> Candida albicans

<400> 304
attggtttca aacagttact cagcacgcca atgaggatgc acagatattt ttagtaggta 60

acaagtgtga tgatgaagta aacagacaag tttctaaaga gcaaggtcaa gaattagctg 120

ctaaattaaa tgttccattt ttggaagcca gtgccaaaag caatgaaaac gttgactcta 180

ttttttacga attggctagt attatccaag agaagcatgt tgaagagaat 230

<210> 305
<211> 575
<212> DNA
<213> Candida albicans

<400> 305
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ccaaccccga gttcaagaaa cagcacctcg aatactatgt gttgtacaac ccagcgttct 120

ccaaagactt ggatattgac atggtccact ccttagacca ctcgtcagtt gtttgctgcg 180

tgagattttc cagagacggc aagttcatcg ccaccggttg caacaaaacc acccaagtgt 240 tcaatgtcac caccggagag ttggtcgcca aattgattga cgagtcctcc aacgaaaaca 300

aagacgacaa caccaccgcc tcaggcgact tgtacatcag atctgtgtgt ttctcccctg 360

acggaaaact cttggcgaca ggtgcagaag acaagttgat tagaatctgg gatttgagca 420

caaagagaat tatcaaaatc ttgaggggcc acgaacaaga catttactcg ttagactttt 480

tccctgatgg cgataggttg gtttcaggct ccggcgatag gtcagtcaga atctgggact 540

tgagaacctc ccagtgttcc ttgactttgt cgatc 575

<210> 306
<211> 286
<212> DNA
<213> Candida albicans

<400> 306
aggtggtgtc atgaaattat tagttggtaa taaggctgat ttgtctgata aaaaaatcgt 60

cgaatatact gctgctaaag aatttgctga tgccttggac attccatttt tagaaacctc 120

cgctttatca tcgaccaatg ttgaacaagc tttttacact atggcaagac aaatcaaagc 180

ccaaatgaca aacaatgcca atgccggaaa tgctgccaat gccaagggca aatctaatgt 240

gaatttgaga ggtgaatctt tgacttctaa ccaatcgaat tcctgt 286

<210> 307
<211> 558
<212> DNA
<213> Candida albicans

<400> 307
ttgcccaatc agcattacaa tttgcaacaa agacaacagg cacaaggaca acaactcaaa 60

ctgcaactaa acgagcaaaa tgccatgatg tctgcctcga ctcaacaata tcctgtccag 120

gattttacaa atccttaccc caatgcacag aatcccgcag aacaacagca acagcaacaa 180

cctcttcgaa cccagtcaca acaatgggac ggctaccaat ctcaaccttt gtattctgct 240

gctggtaata ctataccatc ctcaatccag cagcaaatac caccacagaa tttgtctcca 300

tcagagcagc aacaagtcaa gcaacaacag ccactgccgc cagaacaagg aacaaagaaa 360

aaacctggta gaaaaccaaa attaagaaaa ttatcggaac tgagttctga aacaccacaa 420

gttccaaaaa cagcatccag ttcttcgagc tcaccaactg cagtcaattc tggtaaacca 480

attacaaaaa gatcgcgtat gggatgtctt acatgccgtc aaagaaagaa acgttgttgt 540

gaaacaagac caaggtgt 558

<210> 308
<211> 450
<212> DNA
<213> Enterococcus faecalis

<400> 308
atatcgaagt ggtctattta gaggacttag ctgctgaagc gttgattaat gaagaggtcc 60

gccgacaatt tattgaccaa ttcttagaag aagccaatat tcgcagcgaa tcagcaaaag 120

aaaaagttag agagttaatg ttagaaattg acgacaacga agaacttatt caaaaagcga 180

ttgctggcat tcaaaaacaa gaattaccta aatatgagca agaattttta acagatatgg 240

ttgaagcgga ttatccattc attattgatc caatgcctaa cttatacttc acgcgtgata 300

actttgcgac aatggggcac gggatttctt taaatcatat gtattcagta actcgacaac 360

gggaaaccat ttttgggcaa tacatttttg attatcatcc tcgttttgct ggaaaagagg 420

ttcctagagt ctatgatcgt tcagaatcaa 450

<210> 309
<211> 280
<212> DNA
<213> Enterococcus faecalis

<400> 309
aattaaacaa agcaggaatc aagaaacaag tggctactgt tttaacacag gtggtcgtag 60

atccagcaga tgaggcattc aaaaatccaa caaaaccgat cggtccattt ttaacagaag 120

ctgaagccaa agaagcaatg caagcaggtg ctatttttaa agaagatgca ggacgtggct 180

ggcgcaaagt cgttccaagt cctaagccaa ttgacatcca cgaggctgag actattaata 240

ccttaataaa aaatgatata attaccattt catgtggtgg 280

<210> 310
<211> 600
<212> DNA
<213> Enterococcus faecalis

<400> 310
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ttatcgtgat atgaccgcgt gcttggtttg gggcatgacc tccaaagata ttttaatggg 120

ttcttttgga aaagaagcgg atccttcttc ccatggtcgt caaatgccga atcattatgg 180

ttcaaaagag cataatattg tttccttctc ttcaacagta agtacacaaa tgccattagc 240

aacaggtgtt ggttatgcag cgcaacttca aaaagctgat tttgttgcat tgaccaccac 300 tggggaaggc tctgccaatc aaggagaagt ccaagaagct attaactttg caggcgtaaa 360

aaaattacca gtcatttttg ttgttgaaaa taatgaatat gcgatttctg tcccaattga 420

agaacagtat gccaataaac gaatggccga tcgcgcgaaa gcttatggct ttgaaggtgt 480

gaccgttgat ggtagtgatt ttgctgaagt ctatctagca tttaaagaag cagtaaaagc 540

ggctcgcggg aaaaaaggac caaaattgat tgaattaatg gtttctcgct tgacttctca 600

<210> 311
<211> 528
<212> DNA
<213> Enterococcus faecalis

<400> 311
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atcaactgaa tcatcagcac cagcgaaaaa agttgccggt ggcgatttaa aagatggtac 120

gtataaatta gaagaaaaaa atgaaaaaaa tggttaccgt gcagtctttg aaatgactgt 180

aaaagacggc aaaatcactg aatctaaata tgacaacatc aatgctgacg gcaaatctaa 240

aacagaagac actaagtatg aagaaagcat gaaagcaaaa tctggtgttg gaccaaaaga 300

atacatcaaa caattaaacg attcttttgt taaagcacaa agcgcaagcg gtgtggaagt 360

agtaactggt gcgactcatt catctgaatc attccaaaac tacgcacaac aattaatcca 420

agcagcacaa gctggtaaca cagacacaat cgaaatcgac aatggggcaa cattgaaaga 480

tggtacgtac tcattgaaag aaaaaaatga ctcaaacggc taccacac 528

<210> 312
<211> 451
<212> DNA
<213> Enterococcus faecalis

<400> 312
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acagatacta agtacaaagt tagtttgcag caagctgctg aaatctatga aaaagaagct 120

ggcaacagca aaccattagt aaatgtccaa tttgatacag aaccagcaag tgactacagc 180

tatatcttta ctaacgatac agaaacactt tacgtgaatc ctgaaacagg aaaagtcacc 240

aaaaatactg aagcaaatca acttggcgaa aacgagacag ccttttcagc tgctgaagtc 300

aaagaattag gcgctgttaa cgacgtttta gccaaagcaa aaaaagaagt tggaggactt 360

tctccacgta ttttgacttg gaagttaacc aaaaataaca ataaacttgt ttatacagta 420 gatgttaaaa cgactacggc agatgaaaaa g 451

<210> 313
<211> 274
<212> DNA
<213> Enterococcus faecalis

<400> 313
caaaaccaac agaagaagaa ttaaaacaaa ccttgacgga tcttcaatat gccgtcacac 60

aagaaaacgc aacagaacgc cctttttcag gagaatatga tgacttttac caagacggaa 120

tctatgtaga cattgttagt ggcgagccgt tgtttagctc cctggacaaa tacgatgctg 180

gttgtggctg gccatccttt accaaaccaa ttgaaaaacg tggcgtcaaa gaaaaagctg 240

attttagtca cggcatgcac cgagtagaag ttcg 274

<210> 314
<211> 564
<212> DNA
<213> Enterococcus faecalis

<400> 314
ggcttagttg tcagttgtgg ggcctttttt gcccaaccta ctgtgactca cgcagaagaa 60

gatattaccg cgattgctaa aaaaatgggg acgactttga aagcggatgg cattcccaaa 120

gcagccatcg ttgttgatgc tgattctgga gaaattctct ggtcgcagca accagattta 180

gcgtggaatc ctgccagtat tgccaaagtg atgaccatgt acttggcctt tgaagcaatg 240

gagcaaggaa aatttacaat ggatacgact gtgactgcta cgcaaaaaga tgtcgatatt 300

tctaaaatat atgccattag taataacaaa attacgttag gtgttgctta tccagtccgt 360

gaactgttaa aaatgattgc tgtcccctct tctaatgtgg cgactctcat gttggcaaac 420

ttaatttcag ggaaccagcc tactgacttt gttcatttaa tgaatcaaaa agcggctgaa 480

ctagggatga caaatactac ctattacaac tgcagtggag cgcaagcaag tgcctttaac 540

ggcctgtatc aaatgcaagg aatt 564

<210> 315
<211> 478
<212> DNA
<213> Enterococcus faecalis

<400> 315
gtttgattgt tgcgaggtca aagaataatg ttataggcaa gaatggtaat ataccatgga 60

aaataaaggg agaacaaaag caatttagag agttaacaac gggtaatgtg gttattatgg 120

ggcgaaagtc ttatgaagaa atcggtcatc cgttgcctaa tagaatgaat attgttgttt 180

ccaccacaac agagtatcaa ggagataatt tagtttcagt taaatcatta gaagatgcat 240

tattattggc taaaggacga gatgtataca tatctggtgg atatggacta tttaaggaag 300

ctttgcaaat agtagataaa atgtatatca cagaagtaga tttaaatatt gaagatggag 360

atacattctt tccagaattt gatatcaatg attttgaagt tttgataggg gaaacacttg 420

gtgaggaagt gaaatatacg agaacatttt atgtaaggaa aaatgaattg agtagatt 478

<210> 316
<211> 380
<212> DNA
<213> Enterococcus faecalis

<400> 316
ttttactaaa ccattaggtg taaaattacc cccatttttt gatattgcac attttgacgc 60

aatggctgaa attttaaata aattcccttt agtttacgtg aatagtatta atagcatcgg 120

taatggttta tatattgaca gtgacaagga agaagtggtc attaaaccaa aaggaggctt 180

cggtggactg ggcggcgaat atgtcaaacc aacagcgtta gccaatgttc gtgcgtttgc 240

gcaacgtttg aaaccagaaa tcaaaattat tggaacgggc ggtattacat gtggaaaaga 300

tgtttttgag catcttttat gtggtgcgac attagtacaa gttggcacac aattgcatca 360

agaaggtcca caagtttttg 380

<210> 317
<211> 537
<212> DNA
<213> Enterococcus faecalis

<400> 317
catgtattgg ttgttagata gggagtatga aaacttatat aatagtactt ataaagaaag 60

tgcgcattta agagtgcaaa ttgcagacga tttgtcaaat ttaccattat cctatttttc 120

aaaacataat ttatcagatt tatctcaaac tatcatgtct gacgttgaag gtattgagca 180

tgcgatgagt catgcaatac ctaaatccgg tggtatggct ctgtttttcc cttttatttc 240

agtgatgctt ttggttggta atgtcaaaat gggattagct gttattttgc caacgttatt 300

tagttttgtc ttaatcttgt tatcaaagaa atcccaaacg aaagccaata ctaaatatta 360

cgatactttg agagaaaact cggaagaatt tcaagaaact attgaattgc agcaagagat 420 taatagcttt aatctatcta aaaaagttca agacagactt ttcaaaaaaa tggaagagag 480

tgaaaggatt catttaaagg tagaattaag tactttttca gtcatggcct tatcctc 537

<210> 318
<211> 606
<212> DNA
<213> Enterococcus faecalis

<400> 318
gatcaggaag atcaatcagg aaaaacacaa tggacaaagt attatctaac cgtttatttt 60

tctggcttat ttaattttct gatgattctg attttatcag ttttatttgg gacgttaagc 120

gaaaccttta ttgtatacgt cgtactgatt tttttacggc ctgtcgcagg tggctggcat 180

gcaaaaacta aatggctctg tcgtctagaa agcattgtta tctatgtcgc cataccattt 240

gtattgaaaa attcttctgt gagcttaccg tttatttata aaattctatt gatttgcctc 300

ttagtcgtat tattttattg gtatgcgcca caaggaacag caattgaacc tgttcagcca 360

tctgatttaa acgtgctcaa aaagcaaagc cttataaggg tgtgtttact tattttatgt 420

agtctgtttg tcaaagaaaa gattgcttca gtaatactct acggtctcgt catccaaggt 480

ctgatgatac tccctgtaac aaaaaattta attgaaggaa gtgtttttat gaaatttggt 540

aaaaaaataa ttaaaaatgt tattgaaaaa agagttgcaa aagtcagtga tggtgtggga 600

actaag 606

<210> 319
<211> 507
<212> DNA
<213> Enterococcus faecalis

<400> 319
gttgggctac tcttggttga tttatgcgct gacagtcgtt gtttttacag gatttttact 60

cattcacaaa aagaggttct caatttttaa agcgatattt ttatccgttt ttacattgct 120

tatggtttcg tttatcaatt acacggagca aacgatttta agtgtttttt ttcaacagat 180

ttatcaaaat aaattattat ggattgcctc aaatgttctt ctgttgctta taaatatctg 240

gattgcttta aaaattccca atagtgtttt tttaagatta aatcgtgtgt tagaaaatag 300

ccgaattttt tttggttgtt tacttttatt gttgattctg ttgttacttt ttgtgttttt 360

gatttcgcca gagatttcac ctgactttat gcgaggattt gtcacggtaa atagttctaa 420

attggagtta ttaataagtg taggtttatt tttaattctg attggcttag tcattgaagc 480 ttatttggaa gaacaacgta tcaacac 507

<210> 320
<211> 500
<212> DNA
<213> Enterococcus faecalis

<400> 320
ttacgttaga agaagcatac caagagtcaa aacggatgca agaattggtc aatttttcac 60

caaataatca attgctctat aaaacagctg ttcagctaga aggattgcct cgccatgttt 120

ctacgcacgc agcaggtgtg gtaattagtg atgaaaatct tttgaatttg gttccgttac 180

aaccaggatc gaatgaaatt ttattgaccc aatttactat gaatgatgtt gaaaaaattg 240

gtcttctgaa aatggatttc ttgggcttaa gaaatttatc catcattgat gataccctca 300

cagctgttaa acgcgtctat aatcgaacca ttcgtttaaa tcagattcca ttagatgacg 360

aaacaacgct ggctttattt agaaaagggg aaacaagtgg cgttttccag tttgaatctg 420

ctggaattcg gaatgtatta agaaaattag ggccaactag cattgaagat attgctgctg 480

tcaatgccct gtatcgtcct 500

<210> 321
<211> 407
<212> DNA
<213> Enterococcus faecalis

<400> 321
tttatgaagg cccaaagaat gatcttctgc taccttcaat tcaggctttt ttatcttaag 60

tgcctcaaga aataacgaat cggttttctt tttcattaaa aagacttttg agccttcctt 120

aaattctgag gaaaaaattt cgatgctttt ttcattgtag gttacttttt ctatctgaga 180

aagcggaagt gctttttttgc gaaaccacaa aacatctctg acaattaaag atgtttctgt 240

catattaaaa gaccgcgcaa ttcctagata agcaaacaca aaaaatggaa ccatcaccag 300

attactaatc aagtaaggac cattattttc caatgctaaa attaaactaa taaataatat 360

acaaaatgtg caagaccagt aaataattgt tgatgctaat tctggct 407

<210> 322
<211> 607
<212> DNA
<213> Enterococcus faecalis

<400> 322
tttacctcac cgaccaatcg cggcaacaat tgcatgtgcc tttaggcatt gttagtaatc 60

acgaagccga atttaaagtg ctgattgaag ctttaaaaca agcgattgcc aatgaagaca 120

atcaacaaac cgttcttctc cactcagata gtaaaattgt tgtccaaaca attgaaaaaa 180

actatgctaa aaatgaaaag taccagcctt atttagcaga atatcaacaa ctagaaaaga 240

attttccttt gctcttaatc aaatggctac ctgaaagtca aaacaaagcg gccgatatgc 300

ttgcacggca agcattacaa aaattttatc ccaataaaaa gtagcactgt ttacttaatg 360

cttttccttt attaatttga taattaaaca cgtggagcaa aaattccaag tgatttttgc 420

tccacgttta aaaacagata aacggttctg tctcgacttc ttcttatagc cacttattct 480

tttgtcgtta tttccgcaaa ttgcccattg gttagcgaaa ggattgcttc aggcgctaat 540

tcaatttgca tgccacgttt gcctgcagaa acaataattg cagaatattg ttgagcttct 600

tcagcca 607

<210> 323
<211> 521
<212> DNA
<213> Enterococcus faecalis

<400> 323
tctgtttacg ttagcggtct ttctacaagg aggcgttact gatttaaaca cgaatcaaat 60

tggacaagtg attcctaatg gcccagccgc agaagctggg ttgaaagaaa acgataaagt 120

cttatcgatt aataatcaaa aaatcaaaaa atacgaagat tttacaacca ttgtgcagaa 180

gaaccccgaa aagccgttaa cgttcgtagt tgagcgtaac ggcaaagaag agcaactaac 240

agtgacacca gaaaaacaaa aagtggaaaa acaaacaatt ggtaaagtcg gcgtttatcc 300

ttatatgaaa accgatttac cgtcaaaatt gatgggcggt attcaggata ctttaaatag 360

tacgacacag atttttaaag cactcggctc actattcaca ggctttagtt taaacaaact 420

aggtgggcca gtcatgatgt ttaaattatc ggaagaagca tccaatgctg gagtaagtac 480

agttgtattc ttaatggcca tgttgtcaat gaacttaggg a 521

<210> 324
<211> 531
<212> DNA
<213> Enterococcus faecalis

<400> 324
ggcgacgaag ttaaagtgaa taataaacaa attgtttctg gactcgatgt ttcggcagct 60

tcggttagtg agatgatttc aaagttagta aaagaagatt tggttgagca ttctccttat 120 caaggggtac aattaactga aaaaggctta aaaaaagcga gtacgttaat tcgcaaacac 180

cgaatctggg aagtcttttt agtagagcac ttaaattaca cttggaatga tgtgcacgaa 240

gaggcagaag ttttagaaca tgttacttca cagacgcttg tgaaccgttt agcggattat 300

ttaaatcatc cagaattttg tccacacggt ggtgttattc ccgaagataa tcaacccatt 360

catgaggaga aacgccaaac gttaacagac taccctgttg gcacaaaaat tcggattgca 420

cgtgtcttag acgaaaaaga attactggat tatttagttt ccattgattt aaatattcaa 480

gaagaatata cgattaaaga aattgctgca tatgaaggac cgatcaccat t 531

<210> 325
<211> 342
<212> DNA
<213> Enterococcus faecalis

<400> 325
gatacgaaga agatagcgaa acggttcaag ataaagtcac agcgctgcca agtaccggtg 60

aatttgcttc tgacaacaga aaagcaaaaa gctgtgataa ggaacagaac aagtcaaaga 120

aaatatggaa ccacgtgtag aataaacagt taaagggagg aaacaatcat gggctttatt 180

tgggcattaa ttgtcggcgg ggtcattggg gcaatcgctg gagcaattac taaaaaagga 240

tcatcaatgg cattattgca atatcattgc agggttagtt ggttcaacaa ttggtcaagc 300

catttaggca catgggacaa gcttagctgg gatggctatt gt 342

<210> 326
<211> 512
<212> DNA
<213> Enterococcus faecalis

<400> 326
aagatggtac gtgtattcgt tttgacactc tttggcaagc aggtttgcaa gcttgttttg 60

aaacactaag tatgttagcc cctcatcatt cagcagaaat aaaaaagata ttagctattc 120

aggagcaacg ttttttgcaa aaacatttac ttgatgaagt cctttatcag gaactttatc 180

aggaattggc gcaatttgag gaattagtcg aacagggaat cagcagtcga tggctggagc 240

aattttttta tgattattta cgaaaaaatc tgaaaaagat cgaaccaatt ggtgatttaa 300

aacagttatt tcttgagcta aaacggaaga actataaaat tggattagca acttcagata 360

ctttgccagc gactatgttg attatggaat atcttggttt aacagaaatg tttgatttta 420

ttgcgacagg agatcgttac ttaccgaaac cagatgcgga catgctccaa gccttttgtc 480 agtcatgtca attgaaggcg acagaagtaa tt 512

<210> 327
<211> 643
<212> DNA
<213> Enterococcus faecalis

<400> 327
ttatttctgt tgagggcaaa gcggaagcag gtaaatactt gttcttcaca accttaaaag 60

gaaccgtcaa acggacagcc gtaacagcct tttctaatat ccgtagtaat ggattaatcg 120

ccattagctt aaaagaagat gatgagttag ttaacgtagt aacgactaat ggcaatcaga 180

agatgattat cggaacacat gcaggatact ctgtcacatt tgatgaaaat actgtacgtg 240

atatgggccg gacagcatca ggtgttcgtg gaatccgtct ccgcgaaaat gattatgtgg 300

tcggcgcagc gattctggat gaaaataaag aagtcctagt cattactgaa aatggttatg 360

gtaagcgtac aaaagcctct gaatatccag ttaaaggacg tggcggtaaa gggattaaga 420

cagcaaatat cactgagaaa aatggtccat tagctggttt aaccacggtc aatggtgatg 480

aagatatctt attgattacg aacaaaggcg tcattatccg ctttaacgtt gattctgttt 540

ctcaaacagg acgcgcaaca ttaggggttc gtttaatgag aatggaagat ggtgccaaag 600

tggtaacaat ggctgttgta gaaccagaag aagtggaaga aga 643

<210> 328
<211> 402
<212> DNA
<213> Enterococcus faecalis

<400> 328
ttgatcgttt tgacgtaatg ataaaaaaag cgaagaaaac ctaccaacgc ctagacttag 60

aagaaaaggt cactctttta gaaggacaag cagctgagat tctaccaacg ttggaaggac 120

cttatgactt tatttttatg gatagtgcca aatcaaaata cattgaattt ttacctgaat 180

gtttacggtt gctgccagtt ggcggcgttt tgatggtgga tgatgtattt caagctggga 240

caattttaga ccctgctgag gaagtaccga aaaaaaatcg agcaattcat cgtaaattaa 300

accaattttt agatgtagtc atggctcacc ctgatttaac ttctacttta gttcctcttg 360

gtgatggagt tattttaatt accaaagaga aagaaacgat ta 402

<210> 329
<211> 608

<212> DNA
<213> Enterococcus faecalis

<400> 329
agcgactaga gagcatacaa gtaaacgaac gggcgttgcc ttgtgggtgg tgacggagtt 60

agccataatg gctacagata tcgctgaggt aattggtggt gccgttgctt tgcaattatt 120

atttggtttt ccattattaa ttggtgtgtt gataacaacg tttgatgttt tattactgtt 180

gctactgaca aagttaggct ttcgcaaaat cgaagcaatt gtttcttgtt taattgcagt 240

catctttttt gtttttgctt atgaagtggc attagcagat ccaaatgttg gtgaagtatt 300

acgaggtttt attccagaca caaaaatagc gacagataaa tccatgttat ttttagcctt 360

ggggatcgtt ggagcgacag tcatgcccca taacttatat ttgcattctt ccattgcgca 420

agcacggaaa tttgatcgta acgatgatgt tgagaaagcc aaagcaattc gtttcactac 480

ttgggattca aatattcaat taactgttgc tttcgtcgta aattgtttgt tgttaatttt 540

aggaggagca ttattttatg gaaccaacag tgaattaggt aaatttgttg atttatttga 600

tgctctga 608

<210> 330
<211> 450
<212> DNA
<213> Enterococcus faecalis

<400> 330
aaattgttgc acgtatggaa aaaatgaaag acggaaattt aagtggtatc caacgacata 60

atcaacgaga aaccaataat cattccaatc ctgatattga tattgagaaa tctcacttga 120

attatgactt agtcaatcct ggttcaatca attatcggga gaaaatcaaa caaatcattg 180

agagccaacg aatcagtaaa cgagcggtta gaaaagacgc agtccttgtg aacgaatgga 240

taatcactag tgataccgcc ttttttcaag agaatacaga cacacaagca ttttttaccg 300

atgttgtcgc atatttctct gatcgctgcg gtcgacaaaa tgtcgcctat gccacggtac 360

atttagacga aaccacgccc catatgcact taggaattgt gcctatgtac gaagggcgat 420

tgagcagtaa acaggtgttt agtcggcaaa 450

<210> 331
<211> 360
<212> DNA
<213> Enterococcus faecalis

<400> 331

caatggaaca aaggccactc tgatgaaacg tcgtttgctg aaaatattcc agctaataat 60

tgggaaaacg aattggccat gctctttatc ttaattaatg atggcgaaaa agatgtttcc 120

agccgtgatg gaatgaaacg aacagtagaa acttctagct tttatcaagg ttggttggac 180

aatgtggaaa aagatttatc ccaagttcat gaagcaatta aaacaaaaga cttccctcgt 240

ttaggagaaa tcattgaagc caatgggtta aggatgcatg gaaccacctt aggcgctgtc 300

cctccattta cttactggtc cccaggcagc ttacaagcga tggctttagt tcgccaagca 360

<210> 332
<211> 526
<212> DNA
<213> Enterococcus faecalis

<400> 332
ctgcggttaa agtcgttgca ttttctaaaa gggaaatgag tcccagataa agtgaacccg 60

tatacaagtt tcctacgcga cgactataga tgatgctttc ttcataacgg gctaaaattc 120

gttcctgttc tgcttcagtt tggtcggaga tttttgctaa taaggctttt ttgcccattt 180

ttgtgtaagg aatatggaac gctaaagcat cataatctgc aaaatcaaga ccggttcttt 240

ttttatgttc atcccagact tgggcaaaag attggatgta ggtttcgttt gacaaaggac 300

catcgaccat aggatacgga tggcctgttg gacgccaaaa gtcatagata tcttgcgtca 360

gcatcacatt atcctctttt aaagccaaga tgcgcggttc actagcaact aacattgcaa 420

ccgccccagc tccttgtgta ggctcaccgc cagaatttaa tccatatttt gcaatatctg 480

ctgctacaac caagactttt ttatctggat gtaaggctac gtgatt 526

<210> 333
<211> 512
<212> DNA
<213> Enterococcus faecalis

<400> 333
atccgactat gcgtttactg aagaacaagc tgaagcaatc gttactttac agctataccg 60

tttaaccaat acggatatta ctgatttaca agaagaagcg aaaactttag aacaacaaat 120

tgctgagtta ttgaacattt taaacaatga aaaagaacta ttctcagtca tgaaaaaaga 180

acttcgcgaa gttaaaaagc aatatggcaa tccgcgctta actcaaattg aagaggaaat 240

ccaagaaatc aagattgaaa cagccgtgtt agttgcgcag gaagacgtgg tcgtaaccgt 300

gacgcacgaa ggctatatca agcggagtag tattcgttct tatacagcat caaaaccaga 360 agaaatcggc atgaaagaag gcgacttttt attatatgct ggcgaagtca atacattaga 420

tcatctttta ctagtaacaa ataaagggaa tatgatctat cgccccgtcc atgagttgcc 480

agatttacgc tggaaagaaa ttggcgaaca ta 512

<210> 334
<211> 604
<212> DNA
<213> Enterococcus faecalis

<400> 334
aggatcaatc gtaaatggtg tatacaaaac attttgttat tcatacattt gataaattaa 60

acaatgcctg ctcgtatatt gagaatgcag aaaaaactga agtcacgaat gataatccgt 120

ctgaacactt ggaacattta tttcaatata ttgtgaatga cgataagaca tacatgaaaa 180

aattagtttc tggtcatggc attgtggatc caacaaatcc ttatgaagaa tttaaattaa 240

caaaattaca agcagcaatt caacgaaaaa tcgggtacac attcgatcca aaatcagaac 300

gattgcttcc gccaacgtta acagaattag aaaaaggcaa cgccgtttta gcacaccatt 360

taatccaatc attttctcca gaagatgatt taacgccaga aaaaatacat gaaatagggt 420

acaacacggt gatggaattg acaggtggaa agtatgaatt tgtgatcgcc acacatgtcg 480

acaaagaaca tttacacaat catattattt ttagttcaac caacttaaaa acaggtaaag 540

cctttcgctg gcaaaaagga accaaaagag tctttgaaca aatttcggat aagattgcag 600

cgaa 604

<210> 335
<211> 451
<212> DNA
<213> Enterococcus faecalis

<400> 335
aagatggtga aacattggtg gttacaactg cagatcattc aacaggtggc ttgtctttag 60

gcaaaggaga tcaatacaac tggttgacgg agcctttaca tgcggcaaaa cgcacgcctg 120

atttcatggc agaagaaatt attaaaaatg gtaatgtgga aaaaacagtg actgagtata 180

ttgattttca attaagtgag gctgaattga aagcagtgaa aacagcggcg gagtcaaaag 240

atgttgaaaa aatcgctcag gcattaagaa agatttttga tgaacgttcg aatactggtt 300

ggactactgg cggacacaca ggagaagatg taaatgtcta tgcttatggc ccacaagcag 360

aagcttttttc aggacaaatt gataatacag accaagcgaa gattattttt ggcttagtag 420 atggcaccgg gcaaaaagct gagattaaag a 451

<210> 336
<211> 543
<212> DNA
<213> Enterococcus faecalis

<400> 336
gtttccgttc aaataaccac aaatcagaca acatttacag aggaacaatt aacggattat 60

tggcagttgg ccttgttaaa tagtcagtgc aatacaccgt tagttcagaa agtcctaaaa 120

acacagacac cacaatttga agatcggaaa attatcttac ctgttgataa tgaagcagtt 180

attccttatc tgaagcaaca atatttacca attattgagg aactttattt ctcttatggg 240

tttcctaaat ttcatattga accaaaaatg gatcaacagc aagctgcaga agtgttgaaa 300

aagtttgaag agcaaaaatt agaacaagcc gcagcctttc aacaacaagc tgctgaatcg 360

cttgttaaac atgaacaaat gaaaaaagaa aaacaacaac aagcgcctgc gtttgatggt 420

ccaattcgtt taggtcggaa tattcccaat gatgaaccca ttatgcccat gggaaatata 480

ctggaagaag aacgtcgtat aacgattgaa ggctttattt ttgataaaga agtgcgtgaa 540

ttg 543

<210> 337
<211> 578
<212> DNA
<213> Enterococcus faecalis

<400> 337
aattgcagga ggttcacaac cagagatttt acagctagtt aaaaaagcac taaaagaagc 60

cgagcaaccg ttgcagttta ttgtatttga tacaaatgaa aatcttgata ctgaaaatct 120

ctggaaatat gttcattgct cagatgaggc cgcggtagca caggaagctg tcagtttagt 180

tgcaaccggt caagcacaaa ttttattgaa aggaattatt cagacccaca cattactaaa 240

agaaatgttg aaaagtgagc atcaattaaa aaataaaccg attctttccc atgtagcaat 300

ggtggagctg cctgcgggaa aaaccttctt gttaaccgat tgtgcgatga atatcgcccc 360

cactcaagcg accctcattg aaattgttga aaatgctaaa gaagtcgccc aaaaattggg 420

actgcaccac ccgaaaattg ctttgttaag cgcagcggaa aatttcaatc ctaaaatgcc 480

ttcgtctgtt ttagcaaaag aagtcacggc acattttaat aatcaacaag aggctacggt 540

ttttgggccc ctttcgcttg atttagcgac ctctgaag 578

<210> 338
<211> 320
<212> DNA
<213> Enterococcus faecalis

<400> 338
aatgcgtgat cagggtgtat gataaaactc ttggaaagag gcagaatttt gaaagttgca 60

tatgcaagag tttcatccat tggcaaaact tggaacggca aattcaagag ttaaaaaaat 120

taggagcgaa aaaaatattt gtagagaaaa aatctggcgc aagtattgaa caacgactaa 180

tttttacaga agctatctat tttgtgagag aatccgatat ttttatggta gaagccattg 240

accgattagg cagaaattac gatgaaatta ttcagacggt taatttattg aaaaataaaa 300

atgttcgact cataattaca 320

<210> 339
<211> 693
<212> DNA
<213> Enterococcus faecalis

<400> 339
ctcaacagct tcaacaatcc attcaaattt tacaatttaa tacggaagaa ctggctgcct 60

ttgttgaagc gaaagcacta gagaatccat taattgattt acaagtagac acgcagtaca 120

ccacagattt tccgataact agtcgttctt acaccaacca agacgaagaa aataattata 180

tgaatcaaat tccagactat catttatcat tatttgagtc tttaattgat caaattcatt 240

tgaattaccg cgatacatac ttgcgaacat tggtattgtt tttagtagaa tatatagacg 300

tgaatggtta tttaaagatt tcgttagaag aagcggcaga gaaaaccgaa gcaagcgcca 360

ttcaaatgct agatgcatta actttgttac aacagctaga tccagcaggt gtgggggcac 420

gcaatttaca agaatgtttg atgctacaaa cagaacgaga cgataccgcg cctaacttag 480

cgtatatttt attggaggaa gagtttgatg ccttagtgag tcgtaaatgg ggcccgttag 540

ctaaaaaatt cgggattgaa ttagcagaaa ttcaattgat ttttgattat atacaaacgt 600

tatcgccagc gccagggaat atttttgatg cgaccgagga attgtatatt cgaccagatt 660

taactgtccg aatcaaggaa gatcgaatag tgg 693

<210> 340
<211> 210
<212> DNA
<213> Enterococcus faecalis

<400> 340
aggtttagaa gtgggggagt ttgtacacac gctaggagat gcccacttat atcaaaatca 60

tgtggaacaa atgcaagaac aattatcacg agaagttcgt tctttcccaa cgctcgtttt 120

gaatccagac aaggcttctg tttttgattt tgatatggaa gatattaaag tagaaggcta 180

tgacccacat ccaacgatta aagcgccgat 210

<210> 341
<211> 504
<212> DNA
<213> Enterococcus faecalis

<400> 341
aacgcacatc tgaaagctac gaaaaaactg tcaaccatat gaaagatgta ttgaatgaaa 60

tctcttctcg catgcgtaca cattcagttc catggcatac agcaggtaga tattggggac 120

atatgaactc agaaacatta atgccttctc tattagctta caactttgca atgctatgga 180

acgggaacaa cgttgcctat gaatcttctc cagcaacttc tcaaatggaa gaagaagtag 240

gacatgaatt tgctcacttg atgagctaca aaaatggttg gggacacatc gttgctgatg 300

gttctttagc taacttagaa ggcttatggt atgcccgtaa cattaaatca ttaccatttg 360

ctatgaaaga agtaaaacca gaattagttg ctggcaaatc agattgggaa ctattgaaca 420

tgccaacaaa agaaattatg gacttattag aatcagctga agatgaaatt gatgaaatca 480

aagctcattc agctcgttca ggta 504

<210> 342
<211> 400
<212> DNA
<213> Enterococcus faecalis

<400> 342
atggagggtg ataacatgaa tatcattgac gagctagcat ggcgtgatgc aatcaatcaa 60

caaacaaacg aagaaggact aagagaactt acagaaaata cgagcatttc gctatattgc 120

ggtgtcgatc caactggaga tagcatgcat attggacatt taattccttt tatgatgatg 180

aaacgattcc aattagcagg tcatcaccca tacattttaa ttggtggcgg aactggaaca 240

attggtgacc caagtggacg aacaactgaa cgtgttttac aaacgatgga agctgtgcaa 300

cataatgtgg acagtctttc aaaccaaatg aaaaaattat ttggtaaaga tgctgaggta 360

acaatggtga acaactacga ttggttatca gaactatctt 400

<210> 343
<211> 585
<212> DNA
<213> Enterococcus faecalis

<400> 343
caggaggaac attggttgtt cttcacaaaa atcaaccagt aactattacc tatggcaatt 60

tgaatgctag ttatttgggt aaaaaaattg ctagtgctga attccaatat acagtgaagg 120

ccacacctga ttcaaaaggt cgattgaatg ctttcttaca tgatgatcca gtggccacaa 180

ttgtctatgg aattaacatt gaccctcgta caaagaaggc tggtgctgag attgaaatgc 240

tcgttcgctt ctttggagaa gatggcaaag aaatcttgcc aacgaaagag aatccatttg 300

tattttcagg tgcttcatta aattcacgtg gtgaaaacat tacgtatgag ttcgtaaaag 360

taggaaacac ggatactgtt catgaaatta atggatcaaa agtagctcgt catggaaata 420

aagtttattc taaaacggat attgatgtag ggacgaatgg gatttcaata agtgactggg 480

aagcagttca aggcaaagaa tatattggcg caactgttat ttcaacacca aatagaatta 540

aattcacttt cgggaatgaa attgttaaca atccagggta tgacg 585

<210> 344
<211> 544
<212> DNA
<213> Enterococcus faecalis

<400> 344
cgacagaact tgctaaagta gatccaaaaa cggtaacaaa acaagggatt cgagatacct 60

ttgatgcaga aaaagtgacg attgatttat ccaaagtgaa agtttatcaa gcagacgcaa 120

gtctaaacga gaaagactta aaagctgttg ctgcagcgat taattcagga aaagccaaag 180

acgtgaccgc ttcttatgat cttaatttag accaaaacac cgtcacagca atgatgaaaa 240

ccaacgcaga cggctccgtt gttttagcaa tggggtataa atatttactt gtcttgccgt 300

ttgtagtgaa aaatgtagaa ggcgattttg aaaatacagc tgttcagctg acaaacgatg 360

gtgaaacggt aacaaataca gtgattaacc atgtgccagg tagtaatcct tccaaagatg 420

taaaagcaga taaaaacggt acagttggca gtgtttctct acatgataaa gatattccgt 480

tacaaacaaa aatttattat gaagtgaaat cttccgaacg tccagccaac tatggcggaa 540

tcac 544

<210> 345
<211> 341

<212> DNA
<213> Enterococcus faecalis

<400> 345
cttctttcgt gctttcaacc acaatagatt gctctttatc agccaacagc caatggagag 60

gggataacgg aagttcatca ctaaaattaa tatttactaa attaagattc ttcaataatt 120

tttttgcttc atctacagta gagcattggc ccaataccca aggaataaac tcaaatggag 180

aaacattttc ttttccttct tcaatttttt tataatctgc atagcctgaa aagtttaatc 240

cagccattcc taatcctttt tcatttattg catcataata aagcggataa tcagcaatcc 300

cagcagcaat tccaattatt gcaaaatgat gatctaaatt t 341

<210> 346
<211> 594
<212> DNA
<213> Enterococcus faecalis

<400> 346
aaacctggat gatagtgata ggaagtttat aggtaaatat tttaatgttt cggaagggaa 60

aaaattacca gattttaaac ctgaagaagt taatagttct attttaaaca ttaatatttt 120

aaacaaagat tttaagtctt ttaattggcc atataaaaaa attttatctc atattgatcc 180

agtgaaagaa caactaggga aagatataac catagctcta attgactcgg ggattgatag 240

gcttcatcct aatcttcaag acaataacct aagattaaaa aaccatgtta atgatattga 300

gttagatgaa tatggtcatg gtacacaagt tgctggagta atagacacga ttgctccaag 360

agtaaattta aattcttata aggtgatgga tgggacagat ggaaactcta taaatatgct 420

taaagctata gttgatgcta caaatgatca agtagatata ataaatgtga gtcttggatc 480

atataaaaat atggaaatag acgacgaaag atttactgta gaagcattca gaaaagctgt 540

taactatgca agaaaaaata acattctaat tgttgcatca gcaggaaatg agtc 594

<210> 347
<211> 504
<212> DNA
<213> Enterococcus faecalis

<400> 347
caaggagagc atagtgaatg tgctttggca tgtatcacta tgctacttaa ttattatggt 60

aatcaaagta cactagtaga actaagggaa aaatatgggg tgcccaaagg aggactaact 120

atcaagaata ttcgtactgt ctttgacgaa tatggatttg atgtatcgac atttaaatca 180 agtttttcaa attatttaga tcttccgact cctgtaataa gttattggaa taatcaacat 240

tttgtggtca tagagaaaat aaaaaagaag aaagtattaa tcttagatcc tgcaagtaat 300

aaacgctgga ttgatatttc agaattcaaa aaaaattttt caaatatatt aatatacgca 360

cataagaaaa agactaaaaa agaaggcaaa aggaaacagt ttttttaaa gtcatttatt 420

tttacaaaat tcaaaagata tttctttagt ttaataatat tatcatttgt ttcacaactt 480

ttattactct taattcctat tgca 504

<210> 348
<211> 562
<212> DNA
<213> Enterococcus faecalis

<400> 348
gttagggcac ttagcttttg gattatttaa taaagttaga ccagagtcat taatatttgg 60

gtttataaaa ttttcgtggg aaaatcagtt taagatcaga ttaaatacac agtggggatt 120

ttttggtgga ttatttagat ataaaccaac tacgtttaat aataagaaaa ttctgaggtt 180

gttaaccggg ggaccaatat ttagtctttt ttttacatta accttttttg taaaaattga 240

ctttttcaa tatttttctt tatttaattt ttcgatattt ttaattactg cagttccttt 300

taattttaac gggtttatga atgatggata caatatatat aaattagtta ctaaggatta 360

tatttttgaa atgtattata ttgtatcaaa tagcttactt aataaatata atcagtcaac 420

tttcttaaat acaactgagg tatgcaaaat aataaaaaaa aataaagaat taccattata 480

tgtgctaaat acattcttat tgtatgttat atatgagtat ttaatagaca aaaataatag 540

gaaattaaaa ctaatatacc ca 562

<210> 349
<211> 402
<212> DNA
<213> Enterococcus faecalis

<400> 349
tggaaaattt aagtgtagtt cctagttttg aagaactaag tgttgaggaa atggaagcga 60

ttcaaggtag tggagatgtt caggctgaga caacaccggt gtgtgctgtt gcggcgacag 120

ctgcagcaag tagtgctgct tgtggctggg ttggtggcgg tatttttact ggagtaactg 180

tagttgtgtc tttaaaacat tgttaaaata tactataaaa cttagtgagg tgaagcacag 240

tgctaaataa ggaaaatcaa gaaaactatt actctaataa attagaactt gttggtcctt 300 cttttgaaga gttaagttta gaagaaatgg aagcgattca aggtagtgga gatgttcagg 360

ctgagacaac tccagcatgt tttaccatag gcttaggagt ag 402

<210> 350
<211> 562
<212> DNA
<213> Enterococcus faecalis

<400> 350
agcaaagtgg taacgagaag tacgacatta aaaatttaca agcttggaaa gaaagaaaaa 60

gtgttcttaa acaagatgat ttagactact tgattaaata taaatatgaa tcactggata 120

attttggatt aggaataaca cctattgaaa actttcctga taaagaagtt gcaattcaat 180

acattaaaga tcaatcatgg tatatttttt ttgaatccat tttagattct tataatgata 240

gtgaagagca attattagaa gtagatgcta gttatccttt tagatatttc ttacagtatg 300

ctcgtttatt tttacttgat ttaaactcag agttaaatat ttgtacaaaa gaattcatta 360

ttaatttatt agaaattcta acacaagagc ttattcactt aacaagtaaa acattagtgc 420

tagatttgca tacttttaaa aaaaatgaac ctctaaaggg aaatgatagt agcaagcgat 480

ttatctatta tctaaaaaaa agatttaact ctaaaaaaga tataatagct ttttatacat 540

gctatcctga gttgatgcgt at 562

<210> 351
<211> 590
<212> DNA
<213> Enterococcus faecalis

<400> 351
tagttggaat gaccgagaac gatggctcac cacgaaaaat caatttaaat ggtttagggg 60

aagtttttat ctataaagat catgttgtag caacatttaa tgaaaaagtt gaatctttac 120

ataatgtgaa tgggcatttt tctttcggga ttaaaacgct tatcaccaat agttcgcaac 180

cgaatgtgat agaaacggat ttcggaacag caacggcgac tcaacgtttg acgattgaag 240

gagtgaccaa cacagagact ggccaaattg agcgagacta tccgtttttt tataaagtag 300

gcgatttggc tggagagtca aatcaagtac gttggttttt aaatgtgaac ctcaataaat 360

ccgatgtcac agaagatatt tcaattgcgg atcgacaagg aagtggtcaa caattaaata 420

aagagagttt tacatttgat attgtgaatg acaaagaaac taaatatatt tcacttgccg 480

agtttgagca acaaggttat ggcaaaattg acttcgtaac agataatgac tttaatttac 540 gtttttatcg ggataaagca cgctttactt cctttatcgt ccgttacact 590

<210> 352
<211> 648
<212> DNA
<213> Enterococcus faecalis

<400> 352
tcaacgtcac aaacaagaac ctgatatctg tgaaaatgca aatcaattga atgaagctgt 60

aaagcccaaa accggaaacg aaaacaaaca accaaaaata ccgaagaaaa aatctaatta 120

tagcaagtat atattcgcat tgtttaccgc acttattcta gtaattgtcg ctactggcgg 180

ctatattgtt tatacattaa aacagcaaga agtagaagct caagccaaat atgaaactgc 240

tgtaaaaaat ctcatggctt caatccaaga agagcaagac caaagtggaa tttcaacgaa 300

aatagatact ataaatgacg gagaaaataa gtgccttatt taccgtccag tttatgaaag 360

tactgttcct tttaaaaatg caaaccagct cttagacgag cttgctcaaa agcaacaaaa 420

gaagcatcgt gaaaaagaag tgcttacagt tgccagaata aaagcaacag caatatcttc 480

taaaattggt cagtatagaa ttgaagcaga tagttttatc tgggatcgca gtaaggaaaa 540

ttttaaaaag ccagacagta tttctgagaa agccatttat gtttccgaaa aaactggtaa 600

agaaatcaca aataaggatt tgattccgga tgaaggaagt ctcttagg 648

<210> 353
<211> 520
<212> DNA
<213> Enterococcus faecalis

<400> 353
tcggaagtat tgcgtttggt gggacaacat tagcttacgc tgatgaagtg cataatagta 60

taaatcagga tatacaagat tctggtagta caattattgg agaaaatgat tcttctacca 120

aatcagctga gtataaaatg attcatgaaa ttgatggaac taaaattagt aacggtgaaa 180

atagtaaaga aacaactaca agttcaggaa ctatactggc tgaagaagca atagaaagtt 240

caaatcaaaa aaattcaaag acaagtgaag tcgaacagga tcttcataaa gatgtatcag 300

gatctgaatc agtaaaacaa gtagaaactt ctgattctat aaaaaaatct gaagaatcag 360

ctgttaaaac attaaatctg gatgattcac aagagaatac taattcaata actaccaagg 420

cagaaaatga tgcgctatct acagttaatg atgaaaaagt attaaatgaa agtgatagta 480

ttatcaaatc aattccttcg gaaacagaga atgtcgataa 520

<210> 354
<211> 668
<212> DNA
<213> Enterococcus faecalis

<400> 354
ttgtctttgg gcttctctct tttttcttgc ctatattttt agtctttgga ggcttacttt 60

tttttctttt attattaacg agtacgtcag atacttcaaa aaatgattgt attcagccaa 120

gtataaataa tccaactgat gcgacagata cacctaaatc gatcgagcag tttgtaaaaa 180

gccataaaga tgcttacctt ttatcatgga aagcaggtgg ctttttaccg tctgctagta 240

tttctcaaac gatggtagaa aatgggttta attttactaa tccatcgggg acgtcatttt 300

ggcaggcaca caatatgggc ggtgttaaaa cgtcaaaaaa agaagatttt cctgtaactt 360

tagcaacatt cggccaagat tctgttgata tttctggtac aaagccaggg tcaaacgtcg 420

gtgatggcac tggtggggca tatacctggt ttaaagacta caatgctgga attgttggaa 480

aagcagaatt tatggcacac cagacactgt atacaggtgc tatcaataat actgacggat 540

taagtacttt atcagctatt tattcaggag gatgggctac agaccctact tacctcatga 600

agttacaggc cacatataat agcttaggca agcagtttca atggttggac caagaagcaa 660

tacagaaa 668

<210> 355
<211> 517
<212> DNA
<213> Enterococcus faecalis

<400> 355
ctatagattc cctatcttgt tggtacaaag ataaataaag aaatattttt tttcgataga 60

atacgttaaa atatgaatag atatagatag taattatatt atctataaat agtagagtat 120

aacgatcttt tatttttgga ttttctataa attttaagta gtaagaaaat ctttttcgtt 180

caaacttttc tataatctct aaatttttaa tttgaacaga attagttgaa ataagcatat 240

aaaaatttaa tagtaattgc tccttatcag attttagacg tactctttca attatattca 300

tgatatattc atcgatggta gagcttttat cagcaatttt ttctaattca gagtttatta 360

tatccaaatt atacacaatc actgcctcat ataaatcatg ttttgtttta aaaaagctat 420

atacggtagt agtgctggtt ttagcttcat tagcaatatc taaaagtttt gttttttcat 480

aaccaaattt agaaaagtgt ttcattgcgg taaatat 517

<210> 356
<211> 380
<212> DNA
<213> Enterococcus faecalis

<400> 356
atgtatgtat cttttgttct aagttgtttg cttggatttt ctgcctacag tctattaaat 60

aggctaaatt cgttggaatt tgtggatgtt tggttagaca aagaaacaca aaaaatcaca 120

ctaaaacgct gtttttatga tacgtctttc aagaaacaaa cactaaaaga gttagaacga 180

gtatatttcc aattaaaaga aataatcaac gtgcaaataa acaagcggtc tttaaatacg 240

aatgacatac gtaatgtacg agaactagag gaaaaacaac aagaaataaa acgattcatg 300

ttagacgttt tagaagatgc ttattggaaa gaattagcaa atatgccaga agaccaacga 360

cacttagacg attgggattt 380

<210> 357
<211> 320
<212> DNA
<213> Enterococcus faecalis

<400> 357
aaagtactac cttttattgc cttagtcggc ttgttattgt tgtcaggttg tggaacagat 60

atgaaaaaga tattgactgc cgatggtggt aaatggaaag tggaagaaac acgtgcaact 120

tacacttttt ttgatgacgg taaattttca gctaatgact cagaggatag tgttagtggg 180

acatacactt atgatgaaaa aaataaaaaa ataacctttg acattactag cagaaactct 240

ttcattatgg aaaaagtaga atacaaagat aacaagatta caggggaaat tggcgaaaaa 300

caaagaacac ttataaaaca 320

<210> 358
<211> 503
<212> DNA
<213> Enterococcus faecalis

<400> 358
tgaacaaaaa gcacaggata gtgtaaaaga agttactgaa aatgttactc aaactatttc 60

aaacgatcaa cgtataccag ctgattttgt taggcacgtg gatggcgata ccacagtatt 120

aaaaattgac ggaaaagaac aaaaagttcg gtttttatta attgacacac ccgagactgt 180

gaaaccgaaa acaaaagttc agccgttcgg attggaagct agcaaacgca caaaagagct 240

tttgtctact gcttcagaaa ttacgtttga atatgataag ggcgataaaa cagatcgtta 300 cggacgagcg ttgggctaca tattcgtaga tggaacatta ctacaaaaaa cgcttgtaag 360

tgaaggatta gctcgtgttg cctatgtaaa agagcctaca actaagtatt tggcagaact 420

agagcaagcc caagaacagg ctaaaaatga gtcactcgga atctggagca taccaggtta 480

tgtgacacaa cgggggttta gta 503

<210> 359
<211> 220
<212> DNA
<213> Enterococcus faecalis

<400> 359
tgatgaaaat ttaaaagaag aagcagaaca attatttgat gatttagggt taaatatgac 60

aagtgcaatt acgattttct taaaacagtc tattaatgag caagcaattc cttttatgat 120

taataaggga aacaaagaga ctctacaagc attaaaagac attaaagaag gaaatgttca 180

tggtggattt tcttccgtgg aggatttaat ggaggattta 220

<210> 360
<211> 380
<212> DNA
<213> Enterococcus faecalis

<400> 360
tcaaatacac gtaagccttc tttcgtgctt tcaaccacaa tagattgctc tttatcagcc 60

aacagccaat ggagagggga taacggaagt tcatcactaa aattaatatt tactaaatta 120

agattcttca ataatttttt tgcttcatct acagtagagc attggcccaa tacccaagga 180

ataaactcaa atggagaaac attttctttt ccttcttcaa tttttttata atctgcatag 240

cctgaaaagt ttaatccagc cattcctaat cctttttcat ttattgcatc ataataaagc 300

ggataatcag caatcccagc agcaattcca attattgcaa aatgatgatc taaatttcca 360

acttctcgaa atgaaaactt 380

<210> 361
<211> 511
<212> DNA
<213> Enterococcus faecalis

<400> 361
cattattttc attaggggat attagagata ttcttatcct tataaattat ttttttacgg 60

gaaagattga agacttattt cataagccgt tacatgatta tgagaaaaaa ttttcagaag 120 atatccaaat agaacggata gatatgttat tatctcaaaa ttatgatcca gaaatttatt 180

tatttttata tgaaaataaa attttagaat atgttgtaaa tggtaatgta caagaattaa 240

gtaatatgat atttaaacta agtaatggtg ttgttcctgt ggttagtggg gataacgtac 300

gttctgaaaa gaattattca atagttgtat ttgagaagtt agcacaagca gctataaata 360

tgggaatgga cttaataaat gcatatcaga gtcgagatag ttttataagg aaaaatgaac 420

tatgtataaa tttaaaagaa gtattaaaag ttagagatac tgctatagta ttttatacct 480

ctgaaatagg aaaagctaaa gtaaggaatc t 511

<210> 362
<211> 526
<212> DNA
<213> Enterococcus faecalis

<400> 362
ttgcgatttc tgttgtagga accattattt ttgtaatagg actttatgtt agtaaaataa 60

aaaaataaat cacaattaag gttctggttg ttattaatct atctcatgaa gcattagatg 120

aattagttct agaagtacct gttgtactag ttaaaaatac tgttaaatca aattttttgt 180

ttaaaagaat cattaagttg gtgcctaact ataaaatcaa attgactaaa atccaataac 240

attgggggat actctgtaaa tcgtgtgtcg cagtacgtta gtcttgtaat aaatagatct 300

taattaggag gggtttctat gaaaaatatt ttactttcta ttctaggggt attatctatc 360

gttgtttctt tggcgttttc ttcttattct gtcaacgcag cttctaatga gtggtcgtgg 420

ccactgggca aaccatatgc gggaagatat gaagaaggac aacaattcgg gaacactgca 480

tttaaccgag gaggtactta tttccatgat gggtttgact ttggtt 526

<210> 363
<211> 505
<212> DNA
<213> Enterococcus faecalis

<400> 363
aatcaagccg ctgaaaagaa agaaaaatta gcaattgtga caacgaactc gatcttatcc 60

gatttagtga aaaatgttgg gcaagacaaa attgagctgc atagtattgt gccaattggg 120

acagaccctc acgaatatga accgttacca gaagacattg cgaaagcttc tgaagcggac 180

attttattct ttaacggctt gaacttagaa acaggcggaa atggctggtt taacaaatta 240

atgaaaacgg ccaaaaaagt tgagaataaa gattactttt ctacaagcaa aaatgttacg 300 ccacaatatt taacaagtgc cggtcaagaa caaacagaag atccgcatgc ttggttagac 360

attgaaaatg gcatcaaata tgtagaaaac attcgtgacg tgttagtaga aaaagatcca 420

aaaaataaag atttctatac agaaaacgcg aaaaattata ccgaaaaact tagcaaacta 480

catgaggaag ccaaagctaa atttg 505

<210> 364
<211> 557
<212> DNA
<213> Enterococcus faecalis

<400> 364
aaatgggtga aggaagatta gcaaattatt ctgcttcagg aaatacgttt caagaaaatc 60

cgggatatac gaagaattat aatttctcgg atttacaatt caaccctaaa gcaataactg 120

gtgatgtgtt acagggaaat acaattgatt ttgaggttta tgggaaacat aatattgcag 180

cttcaactgc aaactgggaa attcgtcttc aattagatga acgattggcc cagtatgttg 240

aaaaaattca agttgatccg aagaagggcg taggaaatag tagacgaact tttgtaagaa 300

ttaatgattc gcttggcaga cctacaaaca tttggaaggt taattacatt cgagcaaatg 360

atggactatt tgctggggca gaaacaactg atacacaaac tgctcctaac ggtgtgatta 420

catttgaaaa aaatttagat gaaattttta aagaaattgg tgcagataat cttaaaagcg 480

accgtttaat gtatcgtatc tatttggtaa gtcatcaaga tgacgataaa attgtacctg 540

gaatagaaag cactggt 557

<210> 365
<211> 523
<212> DNA
<213> Enterococcus faecalis

<400> 365
aggtacaggc atctttgttg gaagttcatg tctattttct tcactttttg tagccgcaga 60

agaacaagtt tattcagaaa gtgaagtttc aacagtttta tcgaagttgg aaaaggaggc 120

aatttctgag gcagctgctg aacaatatac ggttgtagat cgaaaagaag acgcgtgggg 180

gatgaagcat cttaagttag aaaagcaaac ggaaggcgtt actgttgatt cagataatgt 240

gattattcat ttagataaaa acggtgcagt aacaagtgtt acaggaaatc cagttgatca 300

agttgtgaaa attcaatcgg ttgatgcaat cggtgaagaa ggagttaaaa aaattattgc 360

ttctgataat ccggaaaata aagatcttgt ctttttagct attgacaaac gtgtaaataa 420 tgaagggcaa ttattttata aagtcagagt aacttcttca ccaactggtg accccgtatc 480

attggtttat aaagtgaacg ctacagatgg aacaattatg gaa 523

<210> 366
<211> 400
<212> DNA
<213> Enterococcus faecalis

<400> 366
ctggttcaaa agaagccatt gatgcccgcg ttcatttaat taaaaaccaa atcggcgaaa 60

caacgtctga ttttgatcgt gaaaaattac aagaacgttt agctaaatta gctggcgggg 120

ttgctgtcgt taaagtcggt gctgcaactg aaacagaatt aaaagaatta aaattacgaa 180

ttgaagatgc attaaacgca acacgtgccg ctgtagaaga aggcatggtt tctggtggtg 240

gtaccgcact tgtcaatgta attggtaaag tcgctgcgct agaagctgaa ggcgatgtgg 300

caacagggat caagattgtc gttcgtgcat tagaagaacc aatccgtcaa atcgctgaaa 360

atgctggtta tgaaggatca gtgattgttg acaaactaaa 400

<210> 367
<211> 264
<212> DNA
<213> Enterococcus faecalis

<400> 367
gatcgcgtcg taattagagt cgcgaaagaa gaagaaaaaa ctgttggagg aattgttctt 60

gcatccgttg cacaagaaaa accacaaaca ggtgaagtta tcgcagtagg tgaaggtcgt 120

gtgcttgaaa atggcacaaa agttccgatg gaagtaaaaa ttggtgacac agtaatgttt 180

gaaaaatatt caggaacaga agtgaaatac gaaggcgtag aatacttaat tgtatcagcc 240

aaagacatta ttgccactgt tgaa 264

<210> 368
<211> 505
<212> DNA
<213> Enterococcus faecalis

<400> 368
atctcgcgga acaattagat agtattcttt tacaagtcag tgaagaagat gaactaatta 60

tttcagatga tggttctact gatcatacgt tggaaatttt gagaacgtat gcagcgaatt 120

atccccaaat tcaattgtta caaggtccag ggcaaggagt gattgctaat tttgcatttg 180

cgcttacgca tacgaaaggc gaagtgatat ttttagcaga tcaagatgac gtttggttgc 240 caaataaagt aacaacagtg acagaatatt ttgaaacgca ccctgacatc caagtggtta 300

ttagtgactt gaaaattgtt gatgcggatt tacaagttac caatccctct tattttaagt 360

ttcgaaaagt caaaccaggg ttttggcgaa atgcgataaa aagtggctat attggggcag 420

gtatggcctt tcgtcaagag atgaaaaacg tcattttacc cattccgcca gaagttccta 480

tgcatgatat gtggattggc ttatt 505

<210> 369
<211> 688
<212> DNA
<213> Enterococcus faecalis

<400> 369
tcggctctaa tggtatgttc cattacatta acaagcgtag cgttgccatc cgcagcattt 60

gcagatgaat acgatacaaa gattcaacaa caagatcaaa aaattaatgc gttaactagc 120

caaatgtcag atgcagaagc aaaagttgcc gcgattgaaa atgatatggt tgaaacggcc 180

aaacaaatcg atacattaac agctaaaaag aacaagctat catcagaagt atctaaatta 240

tatagtgaaa tttctgattt gaatgtccgt attcaaaaac gtgaagtaca aatgacaaaa 300

caagcacgcg atgtccaagt gaatggtcaa agtgattcaa ttattgatgc tgtcttagat 360

gcagattcag tagcagatgc aattggtcgc gttcaagcgg tctcaacaat gatgagcgcc 420

aataatgaat tactagaaca acaaaaagaa gacaaagcga ctgttgaaaa gaaaacaaag 480

aatgttgaaa aacaaattgc tgaattagaa gcagcaacaa aagaattaaa tgataaaaca 540

gaatcattaa aaacattgaa gattcaacaa gaagtggcta aaaatgattt agaagcacaa 600

cgttctgaag aacaagggaa aaaagacggc ttcattaaac agaaaaaaga agcggaaaaa 660

cgtttagcag aagaacaagc acgtcaac 688

<210> 370
<211> 500
<212> DNA
<213> Enterococcus faecalis

<400> 370
gcttcattag cattagaaca atcatcagct gaaagttcta aagctggctt agaaaaacaa 60

aaagcagctg ctgaagcaga gcaagcacgc ttagctgctg aacaaaaagc tgcagctgaa 120

aaagccaaac aagctgctgc aaaaccagct aaagctgaag tgaaagcaga agcaccagtt 180

gcctcttcat caacaacaga agcacaagca ccagcaagct caagctcagc aactgaatca 240 agcacgcaac aaacaactga aacaactaca ccaagtacag ataatagtgc aacagaaaat 300

actggctctt cttcatcaga acaaccagta caacctacaa caccaagcga taatggaaat 360

aatggtggcc aaactggtgg tggaacagtt acaccaacac cagaaccaac accagcgcct 420

tctgctgatc caacaatcaa tgcattgaac gttctacgtc aatcattagg tttacgtcca 480

gtagtatggg atgcaggttt 500

<210> 371
<211> 529
<212> DNA
<213> Enterococcus faecalis

<400> 371
ttaactgaac aagaaaagca agcaatggaa aaagaagcat tagcattaaa taaagttttt 60

cctgaaaatc aagcagatgc ggcaaaagta acggaaatga tcaatgtcaa aaatcctacc 120

gaaaaacaaa agcaacaaat gagcgattac gttgtaggac ttatcaatga tgttcgcgaa 180

aagcttgggt tacaaaagtt gaagatttct aaccaagcta tgaaatttgc ttgggatgta 240

gcaaaatatg ataatcccaa agaatttgat catgacgtaa atgcgatcaa tcgtgcagca 300

aaagaaaatg gttttaaaga attccctgga caaaactttt atgaaaacct aagtatggga 360

agatttacga cacaagaagg taaagtttct atgtatgact ttgaaaaagc tgctcgaaat 420

gcacttgtaa gcatgttgat gaacgatgga cattctggct attcccattt agattcttta 480

ttagatgcaa atgaaacaaa catggcagtt tctatttcag gagatttaa 529

<210> 372
<211> 558
<212> DNA
<213> Enterococcus faecalis

<400> 372
acaaccaaca gtgaaagcta cacaaacaac ggagcaagcc attactgaaa aacagcaaca 60

agtaatagag aaacaagcaa ttgtcgatca aaaacaacaa gttgctgaca ctgcgaaaaa 120

agaaaaagac accattgatc aatctgttaa agaccaacaa gcagtggtcg atcaaaacaa 180

agacgcattg gttcaaagtc aacaagcagt gactgaccaa caagcagttg tagacgaagc 240

taaaaaagtc gtggatgaag caacaccttc agccattgaa aaagccaaag agcaagtggc 300

tactgataca caggctgttg atgaccaaca aaaagtagta gagcaagctc aaacagacgt 360

taaccaacaa caagctgttg ttgatgaaaa agcaaaagaa acgactgctg ctaaagtgca 420 aaatgataaa gatcaacaag cagtaacagc tgcaaaacaa gaacaagtca agcttgaaga 480

attagcgaaa aatgcggaag cggaaaaagt aaaggcagaa aaagaacaag cagcaaaaga 540

agcagaattg gctaacaa 558

<210> 373
<211> 687
<212> DNA
<213> Enterococcus faecalis

<400> 373
cattggtggc tatttcattc gtgaattgga agccactaca atttccgatt ttaaaaaaaa 60

tatggattcc caagttgtcc aattgtcaaa cacgttaagt acgcagatga gcaacaaaga 120

tctcgaacgt agtgacgttg atgcaaattt aaaaaaagcg ttatctgatt tttcaaatgc 180

agatatttct gaagcgagaa ttgtcgatga taaagggatt attcgggcaa ccaatgattt 240

aaatcaacaa aatattattg ggaaaaagaa tgattatcgt gatttaaatg actttacgag 300

taaaaaatat caagctttag ataatgataa acgcgtgtat gtgaatgtcc agccgattca 360

atcgcctact ggagaaacag tgattggcgt cctttatgtg aaaagtaatt tagaaaataa 420

ataccaagaa attaccaaca cagcaagtat ctttttcact gcttctatta ttgccgcagc 480

aatctcgatt attgtgactt tactgattgc acgatcaatc acgaagccga ttggtgaaat 540

gcgcgagcaa gccattcgaa tcgctcgtgg tgattacgct ggaaaagtag aagtccatgg 600

aaaagatgaa ttaggccaat tagcagaaac atttaatcaa ttatcagaac ggattgaaga 660

agcacaagaa acaatggaag cagaaag 687

<210> 374
<211> 534
<212> DNA
<213> Enterococcus faecalis

<400> 374
tatcttagct tcgcaaccag ttactcgttt taggaatgct tttttcaatg aaacggaaga 60

tatccaaacc aatgaagaca gtcaagactt aacctacacg agtaaagaag aacgattgtt 120

tgcagaagaa aaactgggaa aaattgattt taaagggacc ttgccagaag agaataaacg 180

ggactcaatc tataatcaaa gcttttctta tgtaaaacgt ttaggaacca atatggggaa 240

tttgcgttac tttgatcgaa cgaaagatag tgtcaattat cggacttttg tggaaggttt 300

cccagtgttc agtaatgatt taaaaggcca agtggatatt cgcatcacga acaacgatgg 360 tgctgcacca agcgtaacca ttaacacaag tgtgaatacg atccaagtgc cgattccttc 420

agaagaagaa gtgacgctgg aaagcacgga aaaattgatt aagcgtttag aaacggctgg 480

tgctaaaaag gaaaaaattc aatcggctgt tatcggttat acgtggcaga caat 534

<210> 375
<211> 547
<212> DNA
<213> Enterococcus faecalis

<400> 375
gagcaacgtc tcttcttcca gccaaacaga atcgattgaa agtcggttgg aaaaagataa 60

catctcgtat aaagggacac tttcttcaga acgattggaa ggttattatt taagtggcga 120

acaaaccaat ttttctgctg ctttaaaaat ccaacgtgaa aagaataaaa attttttgag 180

aaatgggctg caaattgcgg ataatacttt aacgagtgta cctagtaaaa actattttat 240

tgatcctaag aaaattgata aagatttaag taccttttta aatgaaaaaa atgctttatt 300

attcggagac gaatatcaat acttaccaga attttctcat ttaaaagagc cgacggcaga 360

aattgtggct gcacaatcgt ataaaggaat tccttttaga gacgacacgg caaaattaag 420

tattttagca gattcgtcag gtgaattatg gcaaattagt aaatattcgc aaacgcacat 480

tgaaaatatt gaagagttac gagacaaaac ggatttatat tccaatcgtg atgcgataga 540

cacgctc 547

<210> 376
<211> 224
<212> DNA
<213> Enterococcus faecalis

<400> 376
ttcatcgcaa taatcgttcc tttgttgttc taacggatac aggttattgt agcgatcata 60

ttcgtggtac gattgaaaat gcagatgctt atttagtcga aagcaatcat gaaattgaaa 120

ttttgcgagc aggaccttat ccatggagtc ttaaacaacg gattttagga gataaaggcc 180

atttatccaa tgatgatggt gctcttgtga tggcggatgt gtta 224

<210> 377
<211> 500
<212> DNA
<213> Enterococcus faecium

<400> 377

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tcttcatttg ttgaatatgc tgttttaagt attcgatgcg atattcatca tgtatgtttt     60
tatcatctgt caaaacatct atggcaccta atccattttc tgtaattatg atagggagtc    120
catattttct ataagtgtaa ttcagcagat accgtaaacc cgtcggatca atggtccatc    180
cccatttact agtcacaaga tacgggtttt gaagaccgcc aaataaggca ctcttttctt    240
cagctgctcc ttcgtacttc gcaacagatg atgcataata gttcatacca ataaaatcaa    300
gtgttccttt agagaacata tatttatcat tctctgttat ggtcaacttt attccttggt    360
ctgcatattc attgatttta tagtctggaa actttcctgt gcacatagca tctatttgat    420
agaaatctcg atccatttgt ttaaaagcat tcatcacatt tgttggattg caatctactg    480
gataaacagg ttcgattcca                                                500
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<210> 378
<211> 665
<212> DNA
<213> Enterococcus faecium

<400> 378

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attattgtcg cctctttccg ctacgcgatt aacatgaatc atcaaataag tgtattcatc     60
ttgagataaa taggtgttga actttccttt tacatatatt tctatctttt ctacagctgt    120
atatgcttta gggtatagtt tttttacttg ttcaaataac tgagattcat tttcaacgta    180
tgcttgtttt tttcttaatc gttcaataaa atactgtaaa tgtgtcacta gcctcatgta    240
gttgatgctc tcttcgtcaa tagataaact aaaatgatat ttgatgatat tcaacatgtc    300
tcttagtgtc tccatatctt ctatctgttc atcaaaattg acctgatttt cttgaagatt    360
aacaaagtgt aaggcaattg aaacagcttc atctgtggga aaggaatgat taaaatattt    420
cttcatcatt tttaaagctt ccaaaccgat tttgtaataa actggataaa actttttaac    480
ttcccaaaag agcggacttc taagatattg tccttttttct gagcgtttca atgcaaagga    540
gagatgatct aataaagcta aataaagata atcatttgct tttttaccga tttccttttc    600
tccataacta acgagctcgt tgatcataga gatcagtcta tcatcagaat gcgataacaa    660
atagc                                                                665
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<210> 379
<211> 504
<212> DNA
<213> Enterococcus faecium

<400> 379

ctcctgatcc tcttcttgtg cagggacgcc taagagataa gcagctacag ctgatccagc 60

aaaactaatc acgactgccg ctaacataaa ccagaagttc atgaaatctc cttcacctat 120

atacgctggg aggccaaata aacccaagc aacagaataa gctttaacac tagtcaaacc 180

agcaaataat ccaccaagtc ctcctccaat cattactgca acaaatggtc gacgatattt 240

aacaaagaca ccatagatag caggttcagt cacaccaagt actgcagaaa gtgttactgt 300

cccaaataat tgtttttgtt ttaaattccg tgttcttaag aaatacccaa gcattgctcc 360

cccaacagca atatctgaga ttgtacatga agatataaat gcagggtcat acccatttgc 420

tgcaattaga gaagctacaa ccggcatgat aaagtttcct gcgcccaaca ttataataaa 480

tggttgaaga gcagagtata acat 504

<210> 380
<211> 555
<212> DNA
<213> Enterococcus faecium

<400> 380
cggatgaagg aagtaaagaa aagttgtcag tcgtggctac caattcgatc ttggcggaca 60

tggcaaaaga agtaggtaca atagatatcc acagtatccc gttcggaaca gatccgcatg 120

aatatgaacc attaccagaa gacatcaaaa aggcaagtgg tgcagatgtt attttataca 180

acggtttgaa tcttgaaaca ggtaacagct ggttcgataa cttgatggaa acggctaaaa 240

aagaagggaa agattatttt gcagttagca aaaatgtaga acctctatat ttaactagcg 300

gtgaagaaca tacaaaagca gatccccacg catggctaga cctatctaac ggaataaaat 360

atgtggagga aatcgcacgt atattctctg aaaaagatgc agaaaatgcg acactctata 420

aaaaaaatgc agaagcatat gtggaaaaac taaaagaatt agatacccca gccaagggaa 480

cttttgcttc tatcgaagag aacaaaaaat tattagtaac aagtgaaact gctttcaagt 540

atttacgagc atatg 555

<210> 381
<211> 401
<212> DNA
<213> Enterococcus faecium

<400> 381
aaagcgattt gttgctgaca gcactcgtta gtggaatcgt cttgatattt gtctttttct 60

tttataaaga attgaagatc acatctttgg atccgacaat ggcaaaggct ttttggctga 120 acacttggtt gatccattat cttttgatgt tctttttgac attagtggct gtagtcagtt 180

tacagacagt aggaacaatc ttggtgattg ccatgttgat cacaccagcc gccacggctt 240

acttgctaac gaaccattta ctgaaaatga tcattacagc tgcaggaatc ggtatgctaa 300

gtgcagttgt cggtgtgttt ttcagtatag ttacattggc catcagagct acgatcgtgt 360

tagcatgtac cgcatttttt atccttgcta atttaatttt c 401

<210> 382
<211> 507
<212> DNA
<213> Enterococcus faecium

<400> 382
agccggtaaa ctcagtccgt aaaaaaatag cctacgtgga acaacgaagt gaattggatc 60

tttcctttcc agtgatggta ataggcgttg tacttttagg aacatatcca tctttacgaa 120

ttggacaaag acctgggaaa cctggaaaag aacgtgcaag acaagctttg aaaaaagtag 180

ggttggaaga atatgccaaa agacagatca gcgaactatc gggtggacag ctccagagag 240

tttttattgc aagagctcta gcccaaggag cagaatggat ctttttagat gaaccattcg 300

tagggattga tgcgttaagt gaacgaaaga tctttgacat cttgcaggaa ttgaagaatt 360

caggaaaaac gattttgatc gtccatcatt ttcttcataa agtagacgaa tatttcgatg 420

aggttattct tgtaaataaa cagctgatcg cttccggtcc agtacaagag tcttttacat 480

cagaagacct tcaattgcct tatggtg 507

<210> 383
<211> 456
<212> DNA
<213> Enterococcus faecium

<400> 383
attactcgtt tcccctgaca gttggcagga catgctgatc gtagacaagg tttctaaaga 60

cggtatcgaa gcaaatatgg cagtcatgtc gcaaaaagga ttgattggcc gagtgatcga 120

ggtcaatacg gcttcgtcta aaatcgaatt actgtcatcc tctaatgaaa gctccaatca 180

ttttccagta cgggtatctt cggctaatgg cgaagcgttt ggtttgctta aaaactatga 240

tgaaaagctc catgccttag tggtgaccca attaactggt gatacggata tcaaagaagg 300

ggatgttgtc cagacatccg gtcttggagg gaattctcca gctaacttgc cgatcggtac 360

ggttattaaa acgaaaccag atagttatgg gctggatcgg gaagtttatg tgaaacctta 420 tgcagaaatg tatgacgtgt cagttgtgac gattgt 456

<210> 384
<211> 500
<212> DNA
<213> Enterococcus faecium

<400> 384
atgttgaaga aagaaacaat gaagtactat ctgccaatcg ttttgttctt tttgatgttg 60

atagatggtc atttaacaag aatgctaggg gagtggtcga aaggcaccta tatgtcaaat 120

gcccactttc tgatattggc attattatgt tgcagtatgg cgtttgaaaa acgttattta 180

ctgattacca cgattgttct cggggctatc tatgacgctt actatattgg cgttatcggt 240

atctatgcag tagctctccc tttaattgta tggttgatgt atgtaatgaa agacgttatc 300

catgtcaaca tctttactga atttttcagt atgatcatct ttgtcacggg ttatgaattg 360

tttacgatgg tggtccagtt gatttttaaa ttagcagtag taaataacac gtattttatt 420

acaaggtttt taggacctac actgctgttg aacatgatta tatttgtatt attcattttt 480

ccctttaaga aattattcag 500

<210> 385
<211> 507
<212> DNA
<213> Enterococcus faecium

<400> 385
tcagtcagtt tcttgacctt tttcgtaaag aagccggcct ctcactaaaa gcttcagtaa 60

tcagtcagaa tttcgttcct accgcagctg gattagcctc ctctgccagc gggctagctg 120

ctttagcagg agcttgcaat actgctctta agcttggatt agacgatctc tctctttcaa 180

gatttgctcg acgcgggtct ggttcagctt gccgaagtat tttcggtggt ttcgtcgaat 240

gggaaaaagg ccatgacgac ttaagttctt acgctaagcc agtcccttcc gattctttcg 300

aagacgattt agcaatggtt ttcgttttga tcaacgacca gaaaaaagaa gtgtccagca 360

gaaatgggat gcgtcggaca gtcgaaacat ccaattttta tcaaggctgg ttagattccg 420

ttgaagggga tctatatcaa ttgaaacaag caatcaaaac aaaagatttc caacttctcg 480

gagaaacgat ggaaagaaac ggactaa 507

<210> 386
<211> 508
<212> DNA

<213> Enterococcus faecium

<400> 386
ccaattaggt gaagcagaac ttgtgatagc cggcggaaca gagagtatgt ctcaagcacc 60

tatgctgaaa ccgtatcagt cagaaacaaa tgaatatggt gaaccaattt ccagtatggt 120

caacgacgga ttgactgacg cattttcaaa tgcacatatg ggattaaccg cagagaaggt 180

tgcaacacaa ttttctgtga gcagagaaga acaggatcgc tatgccttgt cgtcccagtt 240

gaaagcagca catgctgtcg aagccggtgt attttctgag gagatcatcc cagtcaagat 300

ttctgatgaa gacgtgttat ctgaggatga agcagttcgt ggaaatagta cattggaaaa 360

actgggcacg ttacgtacag tattctcaga agaaggaact gtaacagcag gaaatgcttc 420

cccgttgaat gacggtgcct ctgtggtgat ccttgcatcc aaagaatacg cagaaaataa 480

taatctgcct tatttagcaa ccatcaaa 508

<210> 387
<211> 501
<212> DNA
<213> Enterococcus faecium

<400> 387
gattgccttt cctttctatg caacaaaagt caccgcattc cttgaagagc tggatgcaat 60

ggacgatcaa ctggtttctt cctactattc aggaaattta gccgaagctc ctcatgcatt 120

aaaaaatatc aaaaaattat tcattcactt aaaaaaacag catgacatcc aaaaaaactt 180

gcaactgacc attgaaagca cgattcctgc tgaacgtgga atgggatcaa gcgctgcagt 240

cgccacagca gtcactcgtg ctttttatga ttacttagca tttcctttgt ctcgtgaaat 300

actattagaa aatgtccagc tttcggaaaa aatcgcccac ggtaatccta gtggaatcga 360

tgcagccgct actagcagct tgcagccgat ttattttaca aaagggcatc ctttcgacta 420

cttttctttg aacatcgatg ctttttgat tgtcgctgat acaggaatca aaggacaaac 480

aagagaagcc gtcaaagatg t 501

<210> 388
<211> 505
<212> DNA
<213> Enterococcus faecium

<400> 388
caagaacaag aaactcagca ttctatcagt gagttacttg ccctggattg gccaggtcta 60

tccattgagc cattgattgc tcctgaagat ttacgtttat tgattggttg gacgggtagc 120

```
cctgcctcta cttctgattt ggtcgatcaa gttcaccgtt cgagagaaga taaaatggtg     180

gcttatcagc ttttcttaaa aaacagtaca gaatgtgtca atgaaatgat caaagggttt     240

aaagaaaata atgtaacgtt gattcaacag atgattcgaa aaaaccgaca attactgcat     300

gatttatctg caatcactgg ggtcgtcatc gaaacgcctg ctttgaacaa attgtgtaat     360

ttagctgaac agtatgaagg agccgcaaaa tcttctggtg caggtggggg cgattgcgga     420

atcgtaattg ttgaccagaa atctggcatt cttcctttaa tgagtgcatg ggaaaaagca     480

gaaatcactc cactgccgtt acatg                                            505


<210>  389
<211>  585
<212>  DNA
<213>  Enterococcus faecium

<400>  389
aaattcactt actgcaccag agccgtagct gaatagaccg atgcgatctc ctggctgtag      60

tgatttcgaa ttttccagta gagaagttag ccccaggtat aatgaaccag tgtaaagatt     120

accgattcgt cggctgtaac ggatgctttc ttcatagcga gccataagac gttcctgatt     180

atcttcgtct gtttggtcta atacgctttg caatgccttt tttcccatct tagtatacgg     240

aatatggaaa gcaatcgcct gataatcttc gagtcctcga cccgacaatt ctttatgtcg     300

attccaaact ttttggaatg attcgatata cgtagaatta gataaaggac catcaacaac     360

aggaaattcg ctataatctg gacgccagaa atcatagata tcttctgtca gaaatacgct     420

gtcgtcttca atcgataaaa tacgcgggtt ttgagtgatc atcatcgcaa cagcaccgac     480

accttgcgtc acttcaccac cgcttgccaa gccgtaacga gcaatatcac ttgctatgac     540

tagtactttt cgttctggat gatttttgac atattctttc gccat                      585


<210>  390
<211>  300
<212>  DNA
<213>  Enterococcus faecium

<400>  390
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atagttgtga taaatcacgt ggtctactca catttgtaat atcataccgc ttttttgctt     120

caggagaaga agctctaata tcaatcctaa accagtattg tcagcgcgac tcataacaac     180

aagttctgtt gttaatggat caaaatttct ttctatacac tcgatactcg cataaaaagg     240
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cttcatgtcg attagaaaat aatcatttac tgattctttc gaataatcca gcatgaataa 300

<210> 391
<211> 273
<212> DNA
<213> Enterococcus faecium

<400> 391
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tagtaaactt aatattttta gtggcataga atattcaaaa ataaataaag gcaccataca 120

tgtagctatc aatataaata cagaacttac gtattttatt attttacgga acattataac 180

ctattacaac tccgcaaata gccatagccc ataccataga taagattttt accagcacca 240

ccaccacatg tttgttttat ctctttcata ctt 273

<210> 392
<211> 626
<212> DNA
<213> Enterococcus faecium

<400> 392
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attttctttc aaaaaatagc atcatttata atatggttct ccgtatcgcg agcgaatgtt 120

attggctaat ctcttggcaa acaagtgttc accacaaaat tcctaactaa acaaaaaata 180

gcataaatta atgctcttag tcacagatca tactgtaaca gtatgatctt attttctgac 240

aaaataagaa taccaatcat ttatggtacg acattctaag cgtaaatgat tgatattctt 300

ttgcagaaac attcttaatt tgtacctaaa gattgctgac taaaaaatag atagaaaatt 360

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ccctattgtc ggggataggt ttcgattaga tgaactcgaa aacgttgcta tatcaattat 480

ggaaacatta ttctctgtcc agtgatggga caatccatac tcttccaatt agttatttgg 540

tcgattcacg ggaaaaattt tatatgcagt tcattattac tactcatctt cagactgtac 600

cgattcaaaa cattaccctt tcttca 626

<210> 393
<211> 508
<212> DNA
<213> Enterococcus faecium

<400> 393

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gtttaacact aatgtcataa ctaataatgg cttattgcta gcgtctatcg aagtattttt 180

tatttccttc aatatcaatg tcatagagat agacatttaa aatctgcgac attttcaccg 240

ggatttagcc catctttttc gtcaattttt ggattctttt ttagtttcta ttggaaagaa 300

tcttcaactg acataattca ttttgtattt ttatctgtcc tcttaacatt ttagtgtcaa 360

ttttaatagt gcttcacacg agaaaggtat aaacatacca ataaatttgg tatgactaat 420

gaaccttgca ctgcatagta tagccatacg cggatatact atatctctta tgttccttag 480

agtaaaacct ctaaatcggt gtgtattg 508

<210> 394
<211> 321
<212> DNA
<213> Enterococcus faecium

<400> 394
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attgcaggaa tgtctatagg tggtttttta ggtggagcaa ttccagggaa gtgctaaaat 180

gaaaaaaaat gctaagcaaa ttgttcatga attatataat gatatatcta taagtaaaga 240

tcctaaatat tctgatattc ttgaggtttt acaaaaggta tatttaaaat tagaaaaaca 300

aaaatatgaa ttagatcccg g 321

<210> 395
<211> 613
<212> DNA
<213> Enterococcus faecium

<400> 395
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agatagaaca agaaaaccaa cgtattactc aacaaataaa gatggctcag ctatttattg 120

aaagtataag taaaggaaaa aatttgtttt caacggatga cagttttggc tacagtaatc 180

aattaaagag catgttgtca gaaaaagaat cactccgcta cgctttgaag caaagtgaat 240

taaatgatca aaagcaatta gaagtatacg aaaagacaaa aagacaacta gaaaaacaaa 300

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aactaaataa tgtttctgat gatcaaaaaa atcaagtgaa actgacaatt tcagcaagca 480

taaatgaaca aattgagcaa ctaaaaaaag aagtagaaca gtatcagtca gaaaaagcta 540

aattagttaa accaactact tctgagaatg acagaattag tcaaacggaa aaaggaaagc 600

aagagctaga aca 613

<210> 396
<211> 400
<212> DNA
<213> Enterococcus faecium

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tctttttcac gataaagtat ttaagatagt attgaaaaca caaagtccgt tagaagttaa 120

aaaatacctc aaacaattcc gaccaaagca aggaatatat ttcttagata ttgatttaaa 180

tcatgaagtt aacggtatag aattagcaga agtaatcaga aaatatgatg ttcaagcaaa 240

aatcattttt acaactactc atgatgagat gttacccgta acaataaaaa gaagagttga 300

aacgttagga tttgtaacaa aagatcaaac actagatgag tatcgaaacg agattgttga 360

gttattgtta ttagcgcaag aaaggataga tgcaacaaaa 400

<210> 397
<211> 533
<212> DNA
<213> Enterococcus faecium

<400> 397
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attaacaagg ggttgtttgt ttttctggat tgtatcccac atgacagaca atgtttcttt 120

cttcaaccga ttgtactcta atggtttttg tagaaaatct gtgacaccat gaagttcata 180

gtcagaaagt ctaaaaccat ctaaatgatt caaagtatcc gtgaagaggg gtgccttttc 240

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gggaatcgaa atgctggcta caatcgtatc ataatgactg ctccaagcat ttagaccatc 420

taaagaaagc gtatttataa tgttttcttc agcttctgat aataattgtg agccatcacg 480

acgaatctcg tttaaacgaa aagcaattgt ttcaaacgaa gattgagaaa gca 533

<210> 398
<211> 171
<212> DNA
<213> Enterococcus faecium

<400> 398
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aacaacacct gcgcctacaa caccatcaac agatcaaagt gttgatacag gaaacggcac 120

aggaagtagt actccggctc caacgccaac accaacacct gaacaaccaa a 171

<210> 399
<211> 519
<212> DNA
<213> Klebsiella pneumoniae

<400> 399
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ttatcacaaa accaccagcg cccagggcgg catcaatacc gactttatga tctccggtcc 120

cgggatcacc cgccacggta aaatcgacgc ctcgacgatg gcggtgtatg acgtggcgcc 180

gacgctatat gaattcgccg gcatcgatcc gaacaagtcg ctggcgaaaa agccggtgtt 240

gccgatgatc ggcgtcagct ttaagcgcta tctcaccggc gaagtacagg agccgccgcg 300

cggcaactac ggggttgaac tgcatcatca ggcggcctgg gtcgatggcg aatggaagct 360

gcgacggctg gtgccgcgcg gcctcaccgc cggcgacgcg ccgtggcagc tgtttaatct 420

gcacgacgac ccgctggaga cgcatgatgt cgcggccgaa catcccgatc gggtcaaagc 480

catgagcgag gcctacgagg catttgctaa gcgcaccat 519

<210> 400
<211> 320
<212> DNA
<213> Klebsiella pneumoniae

<400> 400
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ctcgaaggca acgaagcgct gcaggactac catcgtccgg ataaacgcgg ccggtcgacc 120

tggtcggcag cgctgcgcgg cattgacctg ctccatcagc atcaagtggg ctttaatctg 180

ctggtggtgg tgcataacga gatggcggcc cacgcggcgg cgatttatga ccggctggtc 240

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gaaggatacc agctcagcgc 320

<210> 401
<211> 201
<212> DNA
<213> Klebsiella pneumoniae

<400> 401
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atcatcaacg cctgttccca ggccggccac gtcggtaacc cggagctggc ggtgtatagc 180

tcgagtaaat tcgccgtacg c 201

<210> 402
<211> 305
<212> DNA
<213> Klebsiella pneumoniae

<400> 402
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gggaatctac ttgataacgc ctacaatgcc agcctgcgtc aaccgcaggg ttcaaaacag 120

atcgaatgcc tgatcaacag tgatggccag gaggtgatca ttgagatcgc cgaccaggga 180

tgcggcattg acgaggcgct gcgcgatcgg atcttcgagc gcggcgtcac cagcagcgcc 240

agcaaagatc atggtatcgg actctggcta gtacgcagct acgtggaaca agcaggcggc 300

agtat 305

<210> 403
<211> 608
<212> DNA
<213> Klebsiella pneumoniae

<400> 403
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tccacgacca aattctataa atccactaac atcctctatc tctatatctg ctgcatcatt 120

gtcggcagca tcatgagtat gaaccgcacc acgctgattc agggctttct gaagatcttc 180

ttcccgatgc tgtgcggcga agtggtcggc atgctggtgg gcatcggcgt cggcacgctg 240

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aagaccgacg ttgggaccct cgcctccggc gcgctgctgg cggtactgct gtatatgatg 600

gggatgct 608

<210> 404
<211> 490
<212> DNA
<213> Klebsiella pneumoniae

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cagatccatc cgctgggacg cctgtgggat atcgatgtaa tctgtccgca gaacgggctg 360

gtgggacgcc agtcgctggg cgaatcgcag cgccgctgcc tgctgtgcga tgagccggcg 420

cacgcctgtg cgcgcagccg tcgtcacgac accgatctcg tcgtcgcccg cgttgagcag 480

atgattgacg 490

<210> 405
<211> 509
<212> DNA
<213> Klebsiella pneumoniae

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caccatggtg ttcggacagg tggtattggc cgccatccag tcaatcaccg cctgtttgcc 180

ggtgagctgc aggaactcga ccataccgtc gtggaaacgc tcgccgttat ggcgcacgtt 240

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cgcgagggtg ccgtaaatgg ttttgcactc gccttgcagg tcggcctgca gatcggggtt 360

gctggtttcc agccgatggc gagtgttcag gtagtacccc ccttccgtca cggtaaaggc 420

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<210> 406
<211> 533
<212> DNA
<213> Klebsiella pneumoniae

<400> 406
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caccccctcc agcaccgcgt agccgagctg cgcgcgcagg ctggcgtggg tcatgcccca 300

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gaagaacggc gcgttggctt tatcctcctc gcttagctcg gcaatctccg ccagcagcgc 420

cacctccgtg gtgccggtca agcggcagaa ccactgcaaa cagctggcgg cgctcagcat 480

gacgctcatc tggtgccaca ggttcggcag cacgtgacaa aacgcatgta ccg 533

<210> 407
<211> 260
<212> DNA
<213> Klebsiella pneumoniae

<400> 407
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ggcgcaggga aaccagggca atcacgcccc cggtaaggca gaaggccagc gccagccaca 120

gggtgcccat ttcgccaatg tgaggaatgg taaagctcgg aatatagctg ccgaagaccc 180

cgatgccgat ggaatacacc gcccagaacc agccgatggc cgagctggcg ttgtcgcttt 240

tgacgttatg gacaatcgcc 260

<210> 408
<211> 501
<212> DNA
<213> Klebsiella pneumoniae

<400> 408
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ctaatcaggg cctggtcttt gaagccatca atatggccgt cgtgctccag cttccagccg 120

tctttatttt cgagaataac ggttacggcg aaggaaccgg ccatgactac gccgtgggtg 180 ggcgtgatat cgcccggcgc gccgctggct tcggcctgcc ggcagtgacc gtcgatggca 240

ccgatttctt tgccgtttat gaggcaacct cagaggcggt caagcgtgcg cgagaaggcg 300

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agattttcac cgctaaggtc aagcaacata tcacccagga agaactggcg gcgattgacg 480

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<210> 409
<211> 535
<212> DNA
<213> Klebsiella pneumoniae

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gtgtagccaa ctacactcgc gaaggggagg acgtcaccat cattgcgttg tcggcaatgg 240

tacataaagc aaaccaggtg gcggacaaac tggccagaga ggggatctcg gtcgaggtgg 300

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cggggcgggt cgtgattgtc gacgaatccg ctgcacgctt cggttttgct catgatgtcg 420

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cgccacacac gccggtcccg ttctcccctg ctctcgaaaa actctggatc cctgg 535

<210> 410
<211> 543
<212> DNA
<213> Klebsiella pneumoniae

<400> 410
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ccaggagggt gacgatttca ccagagggca ggaaatatgt gagattgaaa ccagtaaaat 120

cgtcaatgtg ctggaggccc cctttgccgg tacgttacgt cggatactcg cccgcgaggg 180

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gggtgtcgac ctgaaaaaag tcgcggcagc gggcgcgggg atcgtatctc tgtttctgat 540

ctg 543

<210> 411
<211> 596
<212> DNA
<213> Klebsiella pneumoniae

<400> 411
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cattatgaga tccctgtccc ctggtttctg ctgacccatc cggatgggtt tacgctgatt 120

gacggcggtc tggctgtcga aggattgaaa gatcccagcg gttattgggg aagtactgta 180

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ggcattgctc ctgaggatat ccgctatgtg gtcctgtccc atttgcactc tgatcatacg 300

ggagcaattg gtcgcttccc ccatgctacg catgttgtcc agaggcaaga gtatgaatat 360

gcctttgccc ctgactggtt tacttcggga gcctattgcc gacgcgattt cgatcgtccc 420

caacttaact ggctatttct gaacgggttg tccgatgatc actatgacct ttacggtgat 480

ggcacgttac aatgtatttt caccccaggg cattcaccgg gccatcaatc ttttcttatc 540

cgcttaccgg gtggtacaaa ttttacgcta gcgattgatg cggcttatac cttaga 596

<210> 412
<211> 693
<212> DNA
<213> Klebsiella pneumoniae

<400> 412
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tatcaggtga gtcatccgga tcgtctgcgc aacgtccata ctgcccccgc cgatctgtcc 120

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ctggcccccc gctttccgcg cacgctgctg ccgcgctcac ccgcaaacgc actgacggcg 420 tttgaacagg aatgggtaca agcgattcac gatcgccagg tcttcccggt ttttcaacct 480

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ctgcttacgg cctttgttct gcaggaggcc gtgcagaata ttaatgagta tccaggcacc 660

ttctattttt cggtcaacat accctcctca ctc 693

<210> 413
<211> 514
<212> DNA
<213> Klebsiella pneumoniae

<400> 413
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ggttaggcta ccgcactctg gatttcgaaa aatttaccta tcaaggtgac tatcaggggt 180

gcgctgtgat gaattattgc tccatcgatg tgccatatac acgcatcact gagcataagt 240

atttttctcc atgggaaagc catgaaggtt cggtctgcta taaagaatac agtcgcgctt 300

gcggcgagaa tgatattcct tattacccca ttcgacagat gggggagatg gctttactgg 360

aaaaatatct ttctcttgcc gaaagtgaaa aaaatattac cttcgtcggt cggttaggta 420

cctatcggta tcttgatatg gatgtaacca ttgcggaagc gctgaaaaca gccgatgagt 480

ttttatcttc ggtggctaac caggaagaga tgcc 514

<210> 414
<211> 584
<212> DNA
<213> Klebsiella pneumoniae

<400> 414
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ggaaacgata tatcagcatg cccagcagat gctggaagcg gcgcgacagg caatggattc 120

cgcaggcagt cgccaaacgg tcgcccaggg aaagctgacg ctaagcgtcc cgaaagccgt 180

cggccgcttt gtgatccacc cgctgatgat ggcgtttttc caccgctacc cgcaggtgga 240

cgtctgcctg cggctggaag atcgccctct cgattttatc gatgacggta ttgatctggc 300

gctacgcatc accgataccc cctcccccgg cctgcatggc aaaccgctga tgccaatcag 360

gcacgttatc tgcgccactg aggcctattt acagcagcac ggtacgccgt acacgccgca 420 ggatctgcgc gcgcatagct gcattagcct tggcgaaacg cccgccgatg cgcgctggaa 480

gttccgtcgg gaaggcaaaa cagaaacggt gcaaacctac gggcggtacg ccgccaacca 540

taccgccgta cgcctcgacg cggtcagaca gcatttaggg atcg 584

<210> 415
<211> 281
<212> DNA
<213> Klebsiella pneumoniae

<400> 415
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acagatcacc acctcagtgg ataacagcca ggcgcgctgg caggcgctgt tcgacaggtt 180

gaacctgatc aacggcctgc ccgccgggca gttgattatc cacgacttcg gcgccacgcc 240

gggcgtcgcc cgtattcgta ttgaacaggt ttttgaggag g 281

<210> 416
<211> 656
<212> DNA
<213> Klebsiella pneumoniae

<400> 416
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gcgatctact tcctcgccac cagcgtgttc aaacgcacgc cgcaggatgc cgcggtgctg 180

accctcaccg tcgccctgcc aaactatgcc gcgttaggtc tgccgatcct cggcagcgtg 240

ctgggtgaag gcgcgtcaac ctcactgtcg gtagcggtct ctatcgcctg cggctcggta 300

ctgatgaccc cgttctgcct gctgattctg gagcgtgaaa aagcccgcgc cgcgggtgaa 360

aacagcggtt ctacgctggc aatgctgccg gtgctgatgt ggcgttcggt gaaaaaaccg 420

atcgtctggg gcccgctgct tggggtggtg ctttccgcga tcggcattaa aatgccggac 480

ctgctgctgg cgtcgatcaa accgctgggc ctggccgcca ccgccgccgc gctgttcctc 540

accggggtga tcctgtcggc gcgtaaactg cagctcaatg cgctgatcgc tacatcaacc 600

atcgtgaaac tgctggtgca gccgtttatt gcctggggtc tggtgatgtt acttgg 656

<210> 417
<211> 456

<212> DNA
<213> Klebsiella pneumoniae

<400> 417
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gcgccgatgc gctacaacac acccgtgcgg tccagctctg tctgctgatc gccggtgtcg 180

cctgggcgcg cgagctacag cgtcagggcg tggatccgca gatggtcagc ggcctctcta 240

tcggcgcgtt tccggccgcg gtgattgccg gcgcgctcga tttcgccagc gcgctgcggc 300

tggtagccct gcgcggggac ttaatggaac aggcgtatcc tgaaggttac ggactgacgg 360

cgattatggg cctgacccgc ccgcgggttg aggcgctgat gcagggcaac gaggtttatc 420

tcgccaatct gaacgccgaa acgcagttcg tgattg 456

<210> 418
<211> 537
<212> DNA
<213> Klebsiella pneumoniae

<400> 418
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atcttgtact gtttccgtaa acggccaggg cagcgatgcg aacgtttatc tgtcaccagt 120

gactttaacg gaagttaaag ctgccgcggc ggatacctat ctgaaaccga aatctttcac 180

catcgatgtt tctgactgcc aggcggctga tggcaccaaa caggatgatg tgagcaaact 240

gggtgtgaac tggaccggcg gtaacctgct ggcgggcgca accgctaaac agcagggcta 300

cctggctaac accgaagccg ccggcgcgca gaatatccag ctggttctct ccaccgataa 360

cgccaccgcg ctgaccaaca aaatcatccc gggcgacagc acccagccta aagcggccgg 420

tgatgcctct gccgttcagg atggcgcgcg cttcacttac tacgtcggct atgcgaccag 480

cacccccgacc acggttacca ccggtgtggt taacagctac gcgacttacg aaattac 537

<210> 419
<211> 554
<212> DNA
<213> Klebsiella pneumoniae

<400> 419
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tcgacaaccc atctgagctg gtcagcgcgc aggaagtggg cgatggcaac ctcaatctgg 120 tgtttaaagt gttcgatcgt cagggcgtca gccgggcgat cgtcaaacag gccctgccct 180

acgtgcgctg cgtcggcgaa tcctggccgc tgaccctcga ccgcgcccgt ctcgaagcgc 240

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atcccgagct ggcggtgatg gtgatggaag atctttccga ccaccgcatc tggcgcggag 360

agcttatcgc taacgtctac tatccccagg cggcccgcca gcttggcgac tatctggcgc 420

aggtgttgtt ccacaccagc gatttctacc tccatcccca cgagaaaaag gcgcaggtgg 480

cgcagtttat taacccggcg atgtgcgaga tcaccgagga tctgttcttt aacgacccgt 540

atcagatcca cgag 554

<210> 420
<211> 220
<212> DNA
<213> Klebsiella pneumoniae

<400> 420
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tcctgatcca gcaccagccc aacaaagcgg tcgccttcca gcgccgagga cgcgctgaat 120

tcataaccct catttggcca gctgccaatc atctgcgcgc cgcgcgcgct cagggcgtcg 180

aacagcgggc gcatcccgct gacgaagttg tccggatagc 220

<210> 421
<211> 341
<212> DNA
<213> Klebsiella pneumoniae

<400> 421
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ttaaagcgga tgatggaaca gatggcggtg ccgtgcagcc tgctctccga tccgtcggaa 120

gttctcgaca cgcccgccga cggtcactat cggatgtatt ccggcggcac cacgcagcag 180

gagatgaaag aggcccctga cgccatcgat acgctgctcc tgcagccgtg gcagctgctg 240

aagagcaaaa aagtggtgca ggagatgtgg aaccagcccg ccaccgaggt cgccattccg 300

ctggggctgg ccgccaccga tgaactgctg atgaccgtca g 341

<210> 422
<211> 400
<212> DNA
<213> Klebsiella pneumoniae

<400> 422
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ggtcaatctg ctggtcagcc atctctgttc gccgggcgat atcgagtggc tgcgccgatg 120

cgtcgaagcc tttggtctgc agccgataat cctgccggac ctggcgcaat cgatggacgg 180

ccacctggcg cagggcgatt tctcgccgct gacccagggc gggacgccgc tgcgccagat 240

agagcagatg gggcaaagcc tgtgcagctt cgccattggc gtctcccttc atcgcgcctc 300

atcgctgctg gccccgcgct gccgcggcga ggttatcgcc ctgccgcacc tgatgaccct 360

cgaacgctgc gacgccttta ttcatcaact ggcgaaaatt 400

<210> 423
<211> 536
<212> DNA
<213> Klebsiella pneumoniae

<400> 423
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ttcacccatg ccctgctcgg acccgctgcc agcgtaatca tcggcgtggc tttctgtttc 120

gtactttatt tactgaccta cgcgtacata tcaggcgcag catcgatagt gtgggatctc 180

cttcctcccg atattgctgg ccgcagctgg ctgccgatca ttttgctgtc gctgacgacc 240

tcgctgattc tgtgggccgg cggcaaattg cccggttttc tcctctccgg ccttatcgcc 300

gccaaattca cccttttttct cctgctgttc gccggtgccg caggaggcgt aaaagtactc 360

agattactcg acttcgccgg cagcacgccg ctccagtatt acctgccgat cgtaccggtc 420

tgcgttatcg cttttggatt tcatggcagc gtcccctctc tgacaagaat gtaccggggg 480

gataatcatc gtgcggtcct ccgctctctc tattacggtt tcgccgtttc attaac 536

<210> 424
<211> 282
<212> DNA
<213> Klebsiella pneumoniae

<400> 424
aaaagacaag ctgttgctgt ttaccgccgc gctggtggcg gagcgtcgcc tggcccgcgg 60

cctgaagctc aactatccgg agtccgtggc cctgatcagc gcctttatta tggaaggcgc 120

tcgggacggc aaaagcgtgg cctcgctgat ggaggaaggc cgacatgtcc tgacccgcaa 180

gcaggtgatg gagggcgtcc cggaaatgat cccggatatc caggtcgaag ccaccttccc 240

ggacggctcg aagctggtca ccgttcacaa cccgattatc tg 282

<210> 425
<211> 587
<212> DNA
<213> Klebsiella pneumoniae

<400> 425
atttcataaa ctcggattgg tattttgatt tgcattggac cgaccgagca atagccgctc 60

gtgatgctgg ttatgagatt cacatcatta gtcattttgt tgatagtaaa ataaccaata 120

aattcaaatc gttagggttt atctgtcata acgttccgct tgctgcccag tcattcaacg 180

tatttacttt tattcgagca ttctttgatt ctcggaaaat aattaaagaa atagacccgg 240

atctgctgca ctgcatcact ataaaacctt gtctaattgg cgggttcttt gcgaaaaaaa 300

cgcagcgtcc agttattttg agctttgttg gccttggtcg ggtgttttcg gaaaattccg 360

ggcttattaa actactacgg cattttacaa ttaaagcata caaacatatt gcgagtaata 420

aacgcagtat gtatatgttt gagcatgata aagatagaag gaaaattgtt gattttctcg 480

gtattgatat ccagaaaacc attgtcattg atggtgccgg tatcaacccg gaaatatata 540

aatattcgtt ggaacaaaag cgagatatcc ctgtagtgct gtttgcc 587

<210> 426
<211> 320
<212> DNA
<213> Klebsiella pneumoniae

<400> 426
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ccacatatat tgaaagccct caagttgatg tcagcatagc tgcattccgg tcacaaaagg 120

tttatgtaac tggtgaagtt gcaaactctg gaaaacaggc tattacaaat attcccctaa 180

ctgtgatgga tgctatcaat gcggcaggag ggcttgcggc tgatgctgac tggagaaacg 240

ttgttcttac tcataacggt aaagatacaa agatttcatt atatgcacta atgcagaaag 300

gagatctaac ccagaatcat 320

<210> 427
<211> 280
<212> DNA
<213> Klebsiella pneumoniae

<400> 427
tgattcaatt ttagtgatct gcacaggaaa tatctgccgt tctccaattg gtgagcgttt 60

attaagacgg ctattaccaa gcaaaaagat taattccgct ggggttgggg cattggttga 120

tcatgcagca gatgaatccg caattcgcgt cgctgaaaaa aatggtcttt gtctcaaagg 180

ccaccgtggg acaaaattta cctctgcatt agctcgacag tatgatcttt tactcgtgat 240

ggaatattct catctagaac aaattagccg gatagcacct 280

<210> 428
<211> 200
<212> DNA
<213> Klebsiella pneumoniae

<400> 428
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ttagctggcg tgagctattc atgaatgggg ttttaaacta tgaatatatc tccatactct 120

atattacagg ctttatcctg accatcgtcg gcttggccat ctttaataaa ttaaaatatc 180

gatttgcaga gattttgtaa 200

<210> 429
<211> 387
<212> DNA
<213> Klebsiella pneumoniae

<400> 429
tggaaccagt gatcaatttc agtaacgtta cgaaagaata tcctctttac catcatattg 60

gttcaggtat taaagactta gtctttcatc ccaagcgagc ttttcagctg cttaaaggga 120

ggaagtatct cgcgatcgag gatatctcat ttaccgtcgc caaaggtgag gcagttgcgc 180

tgattgggcg aaacggcgca ggtaaaagca cttcgttagg actagtcgct ggcgtaataa 240

agccaacaaa aggctcggtg actactcatg gccgagttgc ttcgatgctg gaactcggcg 300

gtggttttca tccagagtta acgggtcgtg aaaatattta tcttaatgcc acccttctcg 360

ggctgcggcg gaaggaagtt cagcagc 387

<210> 430
<211> 225
<212> DNA
<213> Klebsiella pneumoniae

<400> 430
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cggcacaata gcgtgaatgc ggctctgcca ctccggcgag ttaaactgct gcgggaacat 120

ctgcttgagc acgttcaggg tgattggcgc ggcggtggaa gcccccggcg aagcgccgag 180 cagcgcggaa atggttttct gctgatcgac caccacttcg gtacc 225

<210> 431
<211> 690
<212> DNA
<213> Klebsiella pneumoniae

<400> 431
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acgcgagcag tggcagacct ggacgctgct ggcggctttc tttatctatt acgccctcag 120

taatgtgtgg ggccatacgc cgcagcatat tgactcgccg atcacccacg gcgtgtatct 180

gaccgggtat ctgttgctga tgacgatgct gctcagggac ggacgaaccc gccgactggc 240

gatgctggcg gtggtcggcg ggatcaccgt gctctccctg tggacgctga ttatcgacca 300

tacgctggtt ctcaccgaac gagcggtctc ccccgagaac cccggaccaa cgaacgttat 360

cgaccttgcc ggttactgcg gcatcggcat tttaatctgc ggcatgctac tgaaagaaaa 420

agccagccac tggctctatc tgccggtggt catcatgctg gtgatgctgc tgctcaccca 480

aagccgcggg ccgatcatcg ccctggtgct ggcggtcggc tgtacgctgc acctgcacgt 540

cttcacccgc cgcaacctgc tgatcgccgc ggcgctggcc gtgctggtag cgctgctttt 600

ggtcatgacg ccggtgggcg acatgctgct cgcccgtttc gaggagctgg gcacccaaag 660

cgggctgcgc ctgagcatct ggcaccatac 690

<210> 432
<211> 211
<212> DNA
<213> Klebsiella pneumoniae

<400> 432
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tttggtgatg atggttctgt cattgaaagt cttgggatgc ctttaaagga taatattaac 120

aatggttgtt ttgatgtgaa aaatgagtgg gtttcattat tgcaacccta ctttaaacat 180

aaaatcaatc tttctgatag ttcatatttt g 211

<210> 433
<211> 326
<212> DNA
<213> Klebsiella pneumoniae

<400> 433

ggggagaata tccttgtctt taaacgcgcg ctgggggtga ccaccgggat cctgccgtgg 60

aacttcccgt tctttcttat cgcccgcaag ctggcgccgg ccctgatcac tggaaatacc 120

atcgtcatta agcccagcga atttacgccc aataatgcca tcgcctttgc cgagattgtc 180

catcaggttg ggttgccgaa aggggtcttt aaccttgtgc ttggccgcgg agaaaccgtt 240

ggccaggagc tagccggcaa tccgaaggtg gcgatggtca gcatgaccgg cagcgtggcg 300

gcgggagaaa aaattatggc cgctgc 326

<210> 434
<211> 465
<212> DNA
<213> Klebsiella pneumoniae

<400> 434
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cagggaatat acgaccgctt cgtcaaccgc ctcggtgagg cgatgaaggc cgtccagttt 120

ggcgacccgg cgacgcgaga tgacatcgcg atggggccgc tgatcaacgc ggcggcgcgg 180

gaccaggtgg cgggcaaagt gcgaagcggt ggcgcagggg gcgcgggtgg cgctggcggt 240

cagccgctgg agggcaaagg ctatttttat ccgccgaccc tgctgctgga tgtacgtcag 300

gagatggaca ttatccatga ggaaaccttc ggtccggtgc tgccggtggt ggccttttcg 360

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tatacccgcg atctgaacgt ggcgatgaaa gcgattaagg gactg 465

<210> 435
<211> 465
<212> DNA
<213> Klebsiella pneumoniae

<400> 435
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tatcccgaca gcccggagcg tttttcgatt ggcgcgccgc tggggcgcgg tttacgtctc 120

aaccggttgg ggatccacca cgagcgactg ccgcccgggc ggcgcacctc gtacccgcac 180

gcggagagcg atgaggaaga gttcatctac gtgctggagg gctatccgga agtgtggata 240

aacggctatc tctggaagct ggagccgggg gacagcgtgg gttttcccgc gggtaccggt 300

atctgccaca cttttctcaa taacaccgag caggaggttc gtctgctggt ggtgggcgag 360

gccaacaaga aatacaaccg catctattat ccgctcaatc caggctatgc cgcgacgcgc 420 caggatcgtt gggttgacca tccgccgcaa ttcttcggtc cacac 465

<210> 436
<211> 270
<212> DNA
<213> Klebsiella pneumoniae

<400> 436
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tccagaagcc gggggatata ataaaccagt tcttcaaagg caatactgcc ttgagggata 120

tcagaacggc tcaggcgaca aagaaggtta atcgtggctc gaaggtgatg ccactgctgt 180

gccggggagg atgggagggc gttcatgctt atcggaagtt catgaggaat taaagcaagg 240

atctgatttc cactggtaga cagctcacgc 270

<210> 437
<211> 406
<212> DNA
<213> Klebsiella pneumoniae

<400> 437
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agcctggcat attgagatag catgtaggat agcataaaaa atattttgcc cttggatgta 120

aaaacgtttt ttaaacaaat cagaatagtt ctactctcgt tttattacca attatagctg 180

gcacgtcagc tccttgctca atgcggacct ttcgctcgat agcttgtccg ctccgcgcca 240

gaagcgaaca gtgttatgag tggccagtga taaaacgtca gcccgttgac cttgccttac 300

agcacctcaa ccacttcaaa ttcttctgcg atcaactcca tatcttcaga aaaatgacct 360

tcagagctga aaaatctctg atgctctttc ttccagtatt caaggc 406

<210> 438
<211> 401
<212> DNA
<213> Klebsiella pneumoniae

<400> 438
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cccggcgacg ctgtttgtta tctttatgtc gctggcgaac atccattttg accgctattt 240

gcgggtacgg aagaatctgc taatcagttc aaaatcgata accccaaaag accttgatgt 300 tattctggtt aattatctta aatacaaaaa caccagtgta gggcagttaa ctttaccgac 360

attgtcactg agtaaaacag aatcaaatat gctgcaaatg t 401

<210> 439
<211> 450
<212> DNA
<213> Klebsiella pneumoniae

<400> 439
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ttcccagtcc cagaaacgcg tattacgcgg gttgcactat cagctggatc cgcacgctca 120

gggcaagctg gtccgctgtg tggaaggtga ggtgtttgac gtggcagtgg atatccgtcg 180

ttcatcgcct acctttggta aatgggttgg agcggtgctc agcgcagaga ataaacgtca 240

gctgtggatc ccggaagggt tcgcccacgg gtttatggcg ctgagcgaca cggtgcagtt 300

tgtctataag ggcacgaact actacgcgcc gcagtcagaa cggagtatca tttggaacga 360

tccggagata aggattgact ggccggcact gagcgactgc gtgctgtctc tgtcggagaa 420

agacctgcgg gcacatactc tggccactgc 450

<210> 440
<211> 380
<212> DNA
<213> Klebsiella pneumoniae

<400> 440
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ctgctggcag actgcacggc gacggcaatc cgtgaaacgc tgcgtaatcc ggcgctggcc 120

ggcacgtatc acctggtggc cagcggcgaa acagctggtg cgactatgcc cgctatgtgt 180

ttgaagtggc gagagcgcac ggtgccgagc ctggcggtgc aggaagtgaa gggcattccg 240

aacgacggcc tatccgacgc cggcgaagcg tccgctcaac tcgcgcctgt cgaattaaaa 300

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acagaagtcc tgggcaaata 380

<210> 441
<211> 180
<212> DNA
<213> Klebsiella pneumoniae

<400> 441

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cgcgaatggc aggggccggt gaaaccggac tggcagatcc atatctgtaa cccacgtaaa 180

<210> 442
<211> 689
<212> DNA
<213> Klebsiella pneumoniae

<400> 442
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ttacctttct tgtctcgtct gaaggatctt tatcccgaag gcgtgattgc ggatattggc 120

tgtggacgtg gtgaatggct ggaaatcctg actgaaaatg gtattgcgaa catcggcgtc 180

gatctcgatg atggcatgct ggcacgtgcc aaggaagccg ggctgaacgt gcagaaaatg 240

gattgtctgc agtttctgca aaatcaagca gaccagagtc tgatagcgtt gactggtttc 300

catattgctg agcatttgcc ctttgaggta ttgcagcagc tcgtcatgca taccttacgg 360

gtgctgaaac ctggcggttt gctaatcctc gaaacgccga acccggagaa tgtaagcgtc 420

gggacctgtt cattttatat ggatccaacg cataatcacc ctttgccgcc gccattgctt 480

gagtttttac ctattcatta tggttttaac cgggcaatta ccgttcgtct acaggaaaaa 540

gaggctctca aatccccgga cgcagcggtt aatctggtcg atgtgcttaa aggtgttagc 600

cccgattaca gcatcattgc tcagaaagca gcgcctgcag atgttcttga acgctttgaa 660

accctgttta cccaacaata tggcctgac 689

<210> 443
<211> 581
<212> DNA
<213> Klebsiella pneumoniae

<400> 443
tgcctctatt atccaacctc tgcatgtcgg taaagcaaac tcttataatg atattggctg 60

tgcaggtgat gatactggag ataatatctc gtttaaaaat ccattctact gtgagctgac 120

ggcccattac tgggtatgga aaaatgaatc tctttccgat tatgtcggct tcatgcatta 180

tcgtcgacat ttaaatttct ccacgcagca ggatcatgcg gaagataact gggggtggt 240

gaattatccg ctaataaacc cggactacga ggcacagttt ggattaaccg atgacgctat 300

tcgtacatgc gttgagggga gtgatctttt actacctaaa aatggtcgg taacatcggc 360 tggcagtaaa aataatctcg accactacag caagggtgag tttttacata ttaaagacta 420

caaggctgcg ctagaggttg ttgaagaact ttatccagaa tataagacag caatacagca 480

gtttaataat gccactgatg gttattatac aaacatgttt gttatgcgca aagatatgtt 540

cattgattac tcagagtggt tgtttagcat tctggatcgt c 581

<210> 444
<211> 649
<212> DNA
<213> Klebsiella pneumoniae

<400> 444
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aggaatgtca ggtctttact ggtttagtca aagatcttca cggccaccct tgtgcaatga 180

atcttccttt caggaaagta ccttcatctt ttgctgatac tttacgttat attcgcaccc 240

cccaacgctt tgttcctacc attgacgaga gtgtcatggt tgagacagtt tcgtttgttg 300

gcatgattat tagcagcaaa gtattgcaag agcatattga tcacatccat gatgaactgt 360

ttatctattt tgatgatctt tattttggct atgcgttgac attggacggt caaaaaatcc 420

tctattcacc agaactgatt tttcatcatg atgtcagtat ccaggggaaa atcatctctc 480

cggaatggaa ggtatattat ctgtgccgaa atttaatttt ggccaggaaa ctattccagg 540

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<210> 445
<211> 606
<212> DNA
<213> Klebsiella pneumoniae

<400> 445
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atgaggtttt catcgcgcta tccgctatgc tgggtgagtc gattactgat gttaaggcgc 120

aatttgctga tctccagcca gcagacaaca tagtcgtctg gcatgctgca ggaccagtac 180

gtgcaatgga taaaggtaat gaatggcgtc gggagagcgc agaactgatt cgggaagcgt 240

ttcttgaatc attgcgtccg gatgtcgttt tcattacaag cttgtttgaa ggtcatgtcg 300

acgatgcggc cacttcggta cacaaattta gtcgtcagta caaagtagcc gtactgcatc 360 acgatcttat tcccctggtg caggctgaga cctatctgct ggatgatgta ttcaaatcct 420

attatttaca gaaagtggaa tggttaaaaa acgctgacct tctgctaact aactccgctt 480

atacggcaca ggaagcgatt gagcatctgc atttgcaggg cgaccatgtg cagaatattg 540

cagctgcagc cgatcctcag ttttgtatgg cggaagtgac agcgagcgag aaagagtccg 600

tccttg 606

<210> 446
<211> 450
<212> DNA
<213> Klebsiella pneumoniae

<400> 446
tgacctatca ctcggatatt gtgaaacaaa aacggttaat gaagttgtac cagccgctgc 60

aggagcgatt cctcgccagc gtagactgca tcgtcgcctc gtcgcccaac tacgtggcct 120

ccagccagac cctgaaaaaa tatcaggata aaaccgtggt gatcccgttt ggtctggagc 180

agcatgacgt gcagcacgat ccgcagcggg tggcgcactg gcgggaaacc gtcggcgata 240

acttcttcct cttcgtcggc gctttccgct actacaaagg gctgcacatt ctgctggatg 300

ccgccgaacg taaccggctg ccggtggtga tcgtcggggg cgggccgctg gatgcggaag 360

tgcggcgtga ggcgccacag cgcgggctga gcaatgtggt gtttaccggc atgctcaact 420

acgaagataa atacattctc ttccagctct 450

<210> 447
<211> 507
<212> DNA
<213> Klebsiella pneumoniae

<400> 447
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tggtttccca cagcgccggg gatatcgtca agcactgcga ccgcgccatt ttcctcaaaa 120

atggtgacat ctgcatggac ggcaccgccc gcgacgtaac caaccgttac ctggatgagc 180

tgtttggcaa accggataaa gacagcgcga caaaaagcgc aacggctatc tcgtcagcca 240

gtggcgaaag ccagatgtct ctcgatgaga ttgaagatgt gtaccacacg cgcccaggct 300

accgtccgga agaatatcgc tgggggcagg gtggcgcgaa aatcatcgat tatcatatcc 360

agagcgccgg ggttgatttt cctccctcac tgacgggcaa tcagcagacc gattttctga 420

tgaaggtcgt gtttgaatac gattttgatt gcgtggtgcc tggcatcctg attaagaccc 480 tcgatggctt attcctctac ggaacca 507

<210> 448
<211> 678
<212> DNA
<213> Klebsiella pneumoniae

<400> 448
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aatggcagga gcggctgcag aacgtccagg tgctggagca ggaaaaccag ggcgtctcgg 120

tcgcgcgcaa taccggcctc gccgccgcca gcggcaaata tctcgcgttt ccggatatcg 180

acgacaaact ctatccgggc atgtatcgca cgctgctgga gatggccgag aaagaacatc 240

tcgatatcgc cacctgcaac ggcacctatg tgtacgaaaa gcgccgcgag agccacccga 300

tcttcccact ggatcgcctg ccctcgacgg gtgtgctgcc gggccatgtc tggcttaagc 360

aggccctgga ctcgcggaag tttctgcacg tcacctggct taatatttat cgtcacgact 420

ttatccgcca gcatcacttc catttcgagc ctggcctgcg ccatcaggat atcccatgga 480

ccacagaagc cctgctggcc gcggagcgcg tgcagtacac cagtcagcag ttctatgatt 540

actacattca ctctgagtcg gtgtcgcata agccggacaa cgacgacacg ctgatgcgtt 600

cggcgcgcca ctatatgaag attctggaga tgctggaggc gattaaccag cgctacccgg 660

ataaagtacg ccatatcg 678

<210> 449
<211> 585
<212> DNA
<213> Klebsiella oxytoca

<400> 449
ctctgcctct attgctcttg ctctcacagc gcccgtacat tcatttgcag ccagcgatca 60

gcgtgggtac aaacctgaag acgtcgcttt tgatgaaagt tttttttcgt ttggtggcca 120

tgtagggact tctgttgaat atgaagataa ggtaactcgt ggtttcaata acacggataa 180

aaaggagaag acgattacca atgaggtttt caactttttt tataacaatc cacaatggaa 240

ttttatgggt ttttactctt ttaaaataga aaatagagag caaaaggagc ctggttatta 300

tgagaatgaa gatggtatta agcagctttt ttcattgaat aaaggtcatg atcttggtaa 360

cggttgggct actggtttaa tttatgagct agaatataca agaagtaaag tttattctcc 420

ggatgttagt ggtctacgta aaaaccttgc cgagcacagc attagaccat atttaaccta 480 ctggaataat gattataata tgggattcta ttctaatctt gaataccttt tgagtaaaga 540

agatcgcaat gcatgggggga aaaggcaaga gcagggatat agtgc 585

<210> 450
<211> 340
<212> DNA
<213> Klebsiella oxytoca

<400> 450
tatcgatgcg gatgaaaatt gcccaactac atcgttctct gaaagaggag gggcatcctg 60

ctacaatgat ttatgttact cacgatcaga ctgaagcgtt aactctagga gatcgcattt 120

gtgttcttaa ccatgggaat atcatgcagg ttgatacacc tactgatctt tataattatc 180

ctaataataa gttcgttgcc agttttatcg gttcaccatc aattaatttg atagatactg 240

ctatccgtaa gaataatgag aggttgtatg ttgaaattgc tcctggcgtt gaaatattaa 300

ttccacatag taagcaagtg ttgcttgaag gttatattaa 340

<210> 451
<211> 608
<212> DNA
<213> Klebsiella oxytoca

<400> 451
atccaatgac cagaaatgag ctgcgtagcg cccataataa gaaaagatgc cggaaatata 60

cgcatgcttt ttccctcaga caataacata gttactcctg aaatttgatt tgctcatcaa 120

tgatattacg agcacggtca agtgctgctt ttggcgtttg gtcattgatc cacatatcgg 180

taatcgcatt tgccagtggg gaccataaat aacccatttc cggaatagat ggcatggcat 240

cagagtgaag cccttgttta ataattgcgc tcgtcgcttc atttgcagtt ggtaggattt 300

tgttcatcag attcggtacc ggaggtatag attctgtcat ctcatagcgt ttcattaaca 360

tttcatcaga tgagagatag tcagcgaaaa gttgtgccgc cttaggcgat ttactataag 420

aagagacgac cgccaggcga accgtagaaa acgaacgtgg ctgttttcct tcaagagtag 480

gtatgggaac aacgccaaaa ttaattttac tgttgttata tccctggatt gcccatggac 540

cgtcgatgat ggcagctact ttgccttcag aaaataagcc tcgacgcacc tgtggattac 600

gcatatct 608

<210> 452
<211> 589
<212> DNA

<213> Klebsiella oxytoca

<400> 452
cgtaaatatg ggacaaaggt ataaaccgtt aacgccaaga tcttgcaaat aatcaagttt 60

gttaataatg ccctgcaaat caccgcccat aaagtttttt gaatctggag gcgttcccca 120

cggttgtacg ttttctggcg atatcgatgg atcgccattg caaaatcgtt caggaaagat 180

ctgataccat attgtttttt taacccattc tggcgtagaa agtacatcac ctggattgat 240

ataagggaag caaaaaaagt tggacaagtt actcagttct gtctctgcta caggtggttt 300

acttatatca acacagcgtc gttcaccaaa taataatttt tccccgttat ttccgtataa 360

tataaaacca tagcggctac gtcgtttgca cggagtaaat gcggcaaacc agtggtcata 420

gctctcgctt tgtccctctt tttccatgtg aacttcgttg ccgccgctcc atccatgcgc 480

gtcgctgccg ccaaggtttc caccatctag gccaccttcc tcccattgat agggatcgcc 540

gatccacaga gagactttcg cgacctcgcc tttgactgtg cgaaatcta 589

<210> 453
<211> 528
<212> DNA
<213> Klebsiella oxytoca

<400> 453
gcaagggtag aggtgtattg cgccttttcc ttattagcca tcgccgcatc ataggcaaaa 60

cgatattctt cataatttaa gcgaattatt tctggtagat aattatttgg acagtgtcgg 120

cttaatacac tttttagact taacggaaag tctgagtgta ttgttgctaa tccactgagc 180

actaacaatc taggtttaaa aaccattatt ggatcaagta aggctctggc tagttgatcc 240

atccacattc ggtagacttt ttgcgcccat gcatcactgc catcaactcc ctgaattatt 300

tctaaggcac tcttccgctg aagagagaac tgaaaatact gtctttcgat cccggatgtc 360

gaaatgaatt gatgaacgca tcctatcccg cagcattcgc aaaccggaga tataccatca 420

atgagtggct gataattttt caatgggaga tgagcccagg aaacatttat tgcatggtca 480

aatacgctat catcgttgta tttatcgact acacaaagtt cacagcca 528

<210> 454
<211> 510
<212> DNA
<213> Klebsiella oxytoca

<400> 454
ataagccatg tgtttcttcc cgatgggaaa gcattagagc atttttcata tcaatcacta 60

gcatgaagcg atgtgatgga taaatctttt catctatttc aaatcgagag tacaattcga 120

tagattcatg tggtagcgcg agtcggttaa atgagaacac gataatccga accccgcgct 180

caacggcatt aatgagttct tgagcaatga gttcaagatg gaagtcagtg ttcaggtaaa 240

cttcgatttg agccagttcg agcatttctc tggctttttg tagtgaatta tcaaaaccag 300

agacgttata tatgaactct ttctcttcct gtagcatcat acgtgagagt tcttttttta 360

atacattgat gttttcaatg gtttgctttt ctatgttgct gaaaataagc tcgggagatt 420

ttgcttgata ctctttagta ttgccatcgg ccataaaaat gaagccattt ttatatagac 480

tatcaattga tgagtagacg ctagaacgtg 510

<210> 455
<211> 383
<212> DNA
<213> Klebsiella oxytoca

<400> 455
gccggtaatc ttgagctgct ggcccagggc cgtagcgtgc gcgtggatgt ggccgccggc 60

gccgaagcca tcatgaaagc ggtcgacggc tgcggcaggc tcgataacgt caccggcgaa 120

tccggcacca atatcggcgg catgctggaa cacgtgcgcc agaccatggc cgagctgacc 180

aacaagccga gcagcgaaat atttattcag gacctgctgg ccgttgatac ctcggtaccg 240

gtgagcgtta ccggcggtct ggccggggag ttctcgctgg agcaggccgt gggcatcgcc 300

tcgatggtga aatcggatcg cctgcagatg gcaatgatcg cccgcgaaat cgagcagaag 360

ctcaatatcg acgtgcagat cgg 383

<210> 456
<211> 400
<212> DNA
<213> Klebsiella oxytoca

<400> 456
cctgctctat tccgtcagga gttttgccgc cgcgatgctc gcctattacg ttgccctggc 60

gattggcctt gaacgccctc atgggcactc atcaccgtct acatcgtgtc gcaaacctcg 120

gtgggcgctc cctgtgcaga agcctttatc gcctggccgg taccgtggcc ggcgcggggg 180

ccacggtatt gattgtgccg acgtttgtga atacgccaat tctatgtagc gtgattctgg 240

ctggctggat caccttctgc ctctatttat ccctgcttga acgcacgccc cgcgcctatg 300

cctttgtgct ggccggttat accgcaagcc tgattggttt tcccgccgtc gccgatcccg 360 gcacgtgttt aacatcgccc tcatccgggt acaggaaatc 400

<210> 457
<211> 535
<212> DNA
<213> Klebsiella oxytoca

<400> 457
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ggggtttgct gcacgctgtt tggcagtttc gacacgccgg ccccgcatat tgtgaaatat 120

attatcggct ctgtctgggg cgtagtgata agccttatct atagcttcgc cctgcttcct 180

ccgctcagcg atttccccgt gctggtggcg gtgcttgccc cggtctatct gcttgccgga 240

tcgctgcagg cgcggccccc cacgaccttt atggccatgg ggatcaccct gacgctgccg 300

gtactgtgcg agctgggcgc gcgctacagc ggcgacttcg ccgacgcggc caacaccgcg 360

atcgccctgt tttcgcgac cggctttgcg gttatcggca tgagtctgct gcaaaccgta 420

caggcggacg cggcgataaa gcgtctgctg aaactgtgcc aacgcgatat tcgccgcagc 480

gtgagcggcg tatttaaagg cgatgaaacg cactggacca atctgatgat cgacc 535

<210> 458
<211> 400
<212> DNA
<213> Klebsiella oxytoca

<400> 458
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gggcagatgt ggtgcagatt gcgccggatg tttccgggcc ggtgagcagc gtggcggtgc 120

gggataatca gtgggttaac cgcggcgatg tgctttatgc catcgacccg cgctggctga 180

agctggcggt gctcagcgcg caggccgacg tcgaagcaaa acgtcatgaa atgctgatgc 240

gccaggatgc cgccccgcca cgcgcgctca tcaaaggggt catttccggc gaggatatcc 300

agcaaacagg cagcgcagct gctgttcgcg gcggccaatt atcagggggc gctggctgcg 360

ctggaactgg cgcagtgaaa cttatcccat gcaacgctac 400

<210> 459
<211> 260
<212> DNA
<213> Klebsiella oxytoca

<400> 459

cgttctcccc tgattcttgc cggcaccccg ggaacttaca gctatgcagg aaccggtaac 60

gtagtagcga tcgctcgcga tctggctaag atctgggatc ttcctttagc agtccacctc 120

gatcaccatg aagatctggc cgatatcacg cgcaaagtac aggccggtat ccgctcggtc 180

atgatcgacg gatcgcattc gccttttgaa gaaaacgtcg cgttagtcaa gagtgtggtt 240

gaactgagcc accgctatga 260

<210> 460
<211> 456
<212> DNA
<213> Klebsiella oxytoca

<400> 460
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tggttagcca ggatgccgcc agccgggcaa tatctctgac gtttaccgcg cagcccgcgc 120

tatgccgcat ccaggccgat ccggatcgtt tgaaacaggt gctgcttaac ctttatctca 180

atgctgtcca tgccattggc cgcgagggcg tgattacggt ggcggtgagg gagtgcggcg 240

atgggcgagt caaggtgagc gttgctgaca gcggcaaggg aatgacggcg gaacagctac 300

aggccatttt cacaccgtac tttagtacca aggccgacgg caccgggctg ggcctggcgg 360

tggtgcagaa catcgttgag cagcacggcg ggacaattga cgccgagagc gcccccggca 420

agggcgcgct atttacgttc tatttgccgg ttaatg 456

<210> 461
<211> 536
<212> DNA
<213> Klebsiella oxytoca

<400> 461
tattgaaggc accaccagcg acattcgctt cgtccacaac gttctgttcc cgtacgcccg 60

cgaacgcctg gccggtttcg ttaccgctca gcagtttgtc gagccggtga agaccattct 120

cgataacctg cgcgaagaga tcgcccagcc ggcggctggc gccgaagaac ttattgctac 180

cctcttcgcc tttatggatg aagaccgcaa atcgaccgcc ctcaaggcgc tgcagggcat 240

tatctggcgc gatggctacg ttcatggcga ctttaccggc cacctgtatc cggatgttct 300

gccggcgctg gaaaaatgga agtcacaggg tattgattta tatgtatatt cctcaggctc 360

cgttgctgcg cagaaattgt tatttggcta cagcgatgaa ggtgatatta ctcatctgtt 420

caacggctat ttcgataccc tggtaggtgc caagcgtgaa gcgcagtcct accgcaacat 480 tgctgagcaa ctgggacagc ctcctgccgc catcctgttc ctgtccgata ttcatc 536

<210> 462
<211> 557
<212> DNA
<213> Klebsiella oxytoca

<400> 462
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cgcaacctac ccgggcgacc accgatgcgt tctatccgct gatcctcaac agcgggcgga 120

tccgcgatca atggcacacc atgacccgca ccggcgcggt gccgcgtctg atgcagcata 180

ttaacgagcc ggtggtggag gtcgcgccgg cggacgcgca gcgttatcac ctgctggaag 240

gtgaactggc gcgggtccgc tcaccgaagg gggtgatggt cgcaaaagtg acgatcggcg 300

acgggcaacg gcccgggtcg ctgtttgtgc cgatgcactg gaataatcag tttgctcgtc 360

agggacgggt gaacaacctg ctggctgcgg tcaccgaccc gcactccggg cagccggaaa 420

gtaaacagac ggcggtggcg atagccacct ggcttcctgc gtggaaaggc gagcttttt 480

cgcgccagcc ggttccgctg cccgcttcgc tgcactggcg gcggcgggcg gcgcagggca 540

ttatccatct ttcgctg 557

<210> 463
<211> 231
<212> DNA
<213> Klebsiella oxytoca

<400> 463
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cctgccgccg ctgcaggtgc gcaaaaccac gcctccgctc agccgctggc tgcgcgatgt 120

tacccaacgt cttctgccgc cgctgctcgg gctgggattg ctgctgctgg gctggcagct 180

ggcggcgatg aacagcaaag gtttcccgac gccgctctcc acgctggatt c 231

<210> 464
<211> 459
<212> DNA
<213> Klebsiella oxytoca

<400> 464
gcgataagtt ttcgatttca cggcgacgtt tattacagac gggggcggcg ctgggcggcg 60

cgatgctgct ccccggcata atgcaggcgg cgtgggcggc tgggtcggat aaaccggaac 120

agaccaccgt gcgggtgggg tttattccgc taaccgactg cgctccctta gccattgcct 180 ccctgaaggg gttcgataaa aagtacggta tcaccctcgt gccgagcaaa gaggccagct 240

gggccgcggt gcgcgacaag ctggttgccg gagagctcga cgccgcgcac attttgtacg 300

gcatgctcta cggcctggag ctggggatcg ccagtaaacc gcaggcgatg gccaacctga 360

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tcaccgacct gagcgggctg aaaaaacgga tcggtcagc 459

<210> 465
<211> 594
<212> DNA
<213> Klebsiella oxytoca

<400> 465
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cggagtctga gaccgagcag gtggtggact acgccgtcta tcgtcaaggc gagcggctgg 120

gcctggcgcg tgaaaatcaa aaccattttt ccccggcaaa gccctatatt gataacttct 180

atcagcggat cgccagcgac ggctggcagc agaaaatcga tctgcgcagc ttcacggcca 240

ccaacctgca gccggatacg gagtatgcct ttacggtgcg cgcggtctac gccaatggcc 300

aggaatctcc ggacagcgcg gtggttaaag cgcaaacccg caaaacgccg cacgtcatcg 360

aagccagcac attcggcgcg aagggtgacg gcaccacgct gaatacccag gcgctgcagc 420

gggccattga tagctgtacc gtcacgcact atcctcaggg ctgcaaggtg ctgatttccg 480

gcggcgaatt caaaactggc gcgttgttcc tgcacagcga tatgaccctg gatattgcgg 540

ctggcgccac cctgctgggt tcggacgatc cggcccagta tccgcttgat aaag 594

<210> 466
<211> 625
<212> DNA
<213> Klebsiella oxytoca

<400> 466
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tgggtaagcc agcgggttcc tcacgccgat ctgattgctc agcaggataa agaacattac 120

tacgtcggtt tcttcgcctc acgtaacgcc aaaatcaccg tcagcaatgc ttccctgacg 180

acctccgcgg caaatacggt tccctccgcc ccgtatgttg ccaaaagctg gccgccggtc 240

atgcaaattg cctcggggac aaaaagccag agcaaagagt atctcctgca ggcgcgcacg 300

aatagtgacg gacgcatcac cgtgcgtcag gatgaagtgg tgatcgggca ggataaagcc 360 gtgaaggccg gagagatgta tacccagcct gccgttctga aagataaaag cacattcgaa 420

attagcttca ctccagccac cggcgcaaac acgctgaccc aaacgctgac ggttgaacag 480

agcgccaatg tgacaggcaa tacgctgtac gccgcgccgg atgggctgtc gcaggctaaa 540

gggacgacgg actcgccgct ggatttagcc accgctgtcg acctcgttcc ccctggcggg 600

caaattgtat tagccgcagt gatta 625

<210> 467
<211> 503
<212> DNA
<213> Klebsiella oxytoca

<400> 467
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cgtacctgaa gcgtatcagc gcacccccag agctccgcag gcggtgctgg agattctggc 120

cgggatatct ctcctgccga gggggaagat atggaccgcc tccggtgata cgatgaagag 180

gcgacgttta ccctacgcga atccccacgg actgcacgcg cggccaagcg cggtcctggt 240

gaaagcggtg aagcagtggc gatcgcaaat tcgggtggaa aatctcgaca cccgttccgc 300

tattgttgac gccaaaaatc tgatgcgggt cgtttctctc ggcgcaaagc aggggcatcg 360

gctgcatttt atggccagcg gggaagatgc ccatcaggcg ctggaggcta tcggtacggc 420

ctttaatgcc ggattaggcg aaattgccgc acagccgcag caggtcgttc agccagcaga 480

aaagcctaaa cggagctggc ttt 503

<210> 468
<211> 534
<212> DNA
<213> Klebsiella oxytoca

<400> 468
atccataccc tgacactcaa tacggcaatc gatatgaata tgttttgcga tccgctgaag 60

ccgtcggcag tgaaccgaac ccgacacacg gaatattgcc caaatggtaa aggagtgaac 120

gtatcgctga tattaaatca ttatcagcag cccactcaca ttataggtat tttcggtggt 180

ttcactggcc gttatattgt ggaagagtta cgtcagaaaa aaattaaagt gacgccggca 240

tgggtctctg agccacccag aattaatatt tttattaatg acggcgctga ggaatataag 300

ctcgttaatc ctggagcaaa aattgatgat gagtgtaaac agcaggttat tcatcatctg 360

caatgcgtcg cctctggtga ttatttagcg atcagcggca gcctgccccc ggggattgaa 420 agccgatttt atgctgaaat tattgaatta tgccagcaga aaaggtgtga agttatcctc 480

gatatcagcc atccggtcct gcgccagctg cttgaattac ggcctttgtt gatc 534

<210> 469
<211> 599
<212> DNA
<213> Klebsiella oxytoca

<400> 469
gcttcaggtg ttgaaaatgc gattacgccc gcggatttaa aagatattta tggcgttatt 60

attgccgctg ataaagacgt taacgccgag cgatttaatg gtctgccggt cattgaagtt 120

ccggttaaag aagccattca ccatccggcc gacttaatta ataaatttat cagcggccag 180

gcggcgcgtc gtcagggtat ttctgcctcc gccgattcaa cggagaaatc cgagcgggag 240

tttttcgggc ccaaggtata taagcacctg atgagcggcg tctctaacat gctgccgttt 300

gttgtcgccg gagggatttt gattgccatc tccttcctgt ggggcatcta ctccgccgat 360

ccaaactcgc cgcaatataa cgttatcgcc gccacgctaa tgaaggtggg gtcaacaggg 420

ctttctcaat tcatggtgcg gattttcacg gcttatatgg cctggtctaa ttccgggcgt 480

cccggtaatg gtgcgcgggc tttgtcggtg ggctataagc caaacgcaac cgcgcgacag 540

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<210> 470
<211> 675
<212> DNA
<213> Pseudomonas aeruginosa

<400> 470
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cctggtcgag gccctcgccc aggccagcat cgagcgcgac caggtggccg ccatcggtat 240

caccaaccag cgcgagacca cggtggtctg ggaccgtcac agcggtcggc cgatccacaa 300

cgtcatcgtc tggcagcgcc ggcgcagcgc ggcgatctgc gcgcagctca agcgcgacgg 360

gctggaagac tacatccgcg aaaccaccgg gctggtcacc gatccgtact tctccgggac 420

caagctgaag tggatcctcg acaacgtcga aggcgcccgc gaacgcgcgc gcaacggcga 480

cctgttgttc ggcaccatcg acacctggct gatctggaag ctcaccgaag gcaaggtcca 540

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ggacgcacgg atgctcgagg tgctcgacat tccccgctcg atgctacccg aggtgcgcaa     660

ctcttcggag gtcta                                                      675


<210>  471
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<212>  DNA
<213>  Pseudomonas aeruginosa

<400>  471
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tggctacgcg cgggtcgacc cgacggtcag tcactgtacc cagagcgtac tgccgatttt     180

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cgccggcctg gtgtatgggc tgaccatgcc gctgcatggt gctcgcggcg aactcggcgc     300

gctgagcctc agcgtggaag cggaaaaccg ggccgaggcc aaccgtttca tggagtcggt     360

cctgccgacc ctgtggatgc tcaaggacta cgcactgcag agcggtgccg gactggcctt     420

cgaacatccg gtcagcaaac cggtggttct gaccagccgg gagaaggaag tgttgcagtg     480

gtgcgccatc ggcaagacca gttgggagat atcggttatc tgcaactgct cggaagccaa     540

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<210>  472
<211>  324
<212>  DNA
<213>  Pseudomonas aeruginosa

<400>  472
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ggccatgtcg gccttcttcg cccccgccgc atgggccagg gccttcaggt cgagactgcc     180

gatcaccggc accaccgcca ccagcaactc gcccttctcc gtggcggcga gcagcgtctt     240

gaacacccgc tgcgggtcca ggccgagctt ttccgcggcc tccaggccat aggaaggtgc     300

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<210> 473
<211> 669
<212> DNA
<213> Pseudomonas aeruginosa

<400> 473
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cgaacggatc gagcgagggc tctgccaggg gctcaatgaa cgcctggaca tgccgccgac 180

cttgcccggc gggcaggcca atcccggcta cctgacgccg gcgggctaca gcctgccggc 240

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tggcgccggc ggggccgccg tacgcagcgt agtcgtacct ttctactggg gcttccgcga 360

ggaagagcaa tacatcaaca agaccgcggc ccacggcgaa tggctggacc gcaacggcaa 420

ccggctggac aagtccggca ccaaggaagg cgggcagttc gtcaatgcca ccaccaacct 480

gccggacatg tggggccagg gtttcaacgg caagctgttc ggtttcatct cgctggactg 540

gttcggcggc accatgaccc atccgctgtt ttcggcggca gggcgcaagt acatggtcct 600

tgcggccatg cgcctggcca tgttgatcaa gatcatccgc aagcgttacc cggacgacac 660

catcaatgt 669

<210> 474
<211> 810
<212> DNA
<213> Pseudomonas aeruginosa

<400> 474
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ggtcagcggg gattcctcgc aactgaccga cagccacctg gtcgccctgc gcctgcagca 180

gcaggtcgag cgcatccgcc agacccgcac ccagttgctc gacggtctct accagaacct 240

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taccctgccc ttcctcatcg gcgacaaggg gcgcgtgctc gccagcctga gcctggaggc 360

cggcggccgc gggctggcct atggcaccaa cgtgctcacc cagttgagcg ggaccaatgc 420

cgcccacgcg ccgttgctga agcgggcggt gcagtggctg gtgaacggcg acccgggcgc 480

ggccactgcg aaggacttca aggtcagcgt ggtcggggtg gacaagaccg ccgccctcaa 540

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gagcgccacg gtgcgcgcac ggctacaggc cgggctgccg atcctcttcg tgcacaccaa 720

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cccctacggc ggtaactact gggacaagga 810

<210> 475
<211> 524
<212> DNA
<213> Pseudomonas aeruginosa

<400> 475
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ccagccaggc aatgccattg gctagcgcat tttccggact ggtcgtggaa gccagcaaga 180

cggctgccgg ttatcaagcg cggttgcgcg acctgtcgat ccgcaacggc ctggacgtcg 240

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tgtccgccac cctcgaccgc ctggtcgtcc tgggtaaagg caga 524

<210> 476
<211> 704
<212> DNA
<213> Pseudomonas aeruginosa

<400> 476
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caggcgctgg acatgctggg caggaccagt cgccaggcgg gtcaggccaa gaagcctgtg 180

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ggcgcctacc gcgcgcccct gcaggatatc tccgggatga ccgacgagct gttcaggaat 660

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<210> 477
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<212> DNA
<213> Pseudomonas aeruginosa

<400> 477
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tgagcctgtc cctgcgctcg ccgcaagctc cccagagtat cctgctcgga cgtt 234

<210> 478
<211> 349
<212> DNA
<213> Pseudomonas aeruginosa

<400> 478
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ggaacaacat cagccagcca cggcgtctgt acaaggccca cggcctggcg ttgctggggc 180

gcgacgagga ggccctggag gcgctgctgc cgttctccga gattgccccg cgctaccgta 240

cgatctggct gcgcgccgtc tacctgctgc tgcaacggac ccctgagcgc aacacctggg 300

acttcggcgg gcgcctgcag cagatgctcg aacactactc gcagaaggg 349

<210> 479
<211> 402
<212> DNA
<213> Pseudomonas aeruginosa

<400> 479
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actttgcaga agtggctggc cgcgggcgcc ccggtcgacc agcagccgtt gcggccgacc 300

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<210> 480
<211> 514
<212> DNA
<213> Pseudomonas aeruginosa

<400> 480
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ggttcctgcc ggcgttcgca atgcattggc actggaggcg tccgctctgg ggcttcctgg 180

cacggctgat ttgcaaagcg tcgccaaggc aggtggcacg gttgatatgc cggtacgact 240

cacgagtgct gcacaagaga gcccgagtgg taaatcgcag attgccgcga tgttgaccaa 300

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ccggtatgag gtgacggttc ccgcaaagtc caccgtgccg aatacaccac cgctgatctt 420

gacctggacc cctgccaccc ctccaggaag ccagaacccc tcaagcacca ctccggtcgt 480

accgcagccg gttccggtgt atgagggagc aacg 514

<210> 481
<211> 604
<212> DNA
<213> Pseudomonas aeruginosa

<400> 481
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<210> 482
<211> 412
<212> DNA
<213> Pseudomonas aeruginosa

<400> 482
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<210> 483
<211> 320
<212> DNA
<213> Pseudomonas aeruginosa

<400> 483
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aaccccgacc attgcgggga ctctgggtaa ctctgctggt aaggccatca gcggtgccgt 240

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caactggaaa gccaactacg 320

<210> 484
<211> 738
<212> DNA
<213> Pseudomonas aeruginosa

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ctggtagaag ctctggac 738

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<211> 740
<212> DNA
<213> Pseudomonas aeruginosa

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<210> 486
<211> 680
<212> DNA
<213> Pseudomonas aeruginosa

<400> 486
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<210> 487
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<212> DNA
<213> Pseudomonas aeruginosa

<400> 487
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<210> 488
<211> 351
<212> DNA
<213> Pseudomonas aeruginosa

<400> 488
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<210> 489
<211> 530
<212> DNA
<213> Pseudomonas aeruginosa

<400> 489
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<210> 490
<211> 569
<212> DNA
<213> Pseudomonas aeruginosa

<400> 490
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<210> 491
<211> 345
<212> DNA
<213> Pseudomonas aeruginosa

<400> 491
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agatcctccg cgaacaggcg tcttggcaga aagcgccggg cgactcggtg ctgaccctgt 180

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<210> 492
<211> 576
<212> DNA
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<400> 492
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atcggagagc agcggtcgct tcgggcagat ccgccagagc atcgccgagg cgcagatgcg 540

catcgcccaa cgcgaggagg agtaccgcaa ggaagt 576

<210> 493
<211> 581
<212> DNA
<213> Pseudomonas aeruginosa

<400> 493
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<213> Pseudomonas aeruginosa

<400> 494
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gggcgaagac aacgggctcg acgttctcgc ccagatgcgc gtccaggcgc catggatgcg 180

cgtggtgatc gtcaccgcgc attcggcggt ggataccgcg gtcgatgcca tgcaggccgg 240

cgcggtggat tacctggtca agccctgcag cccggaccaa ctgcgcctgg ccgccgccaa 300

gcaactggag gtgcgccaac tgaccgcgcg cctggaggcc ctggaggacg aagtgcgccg 360

ccagggcgac ggcctggaat cgcacagccc ggccatggcc gcggtactgg agaccgcgcg 420

ccaggtagcg gcgaccgacg ccaacatcct catcctc 457

<210> 495
<211> 289
<212> DNA
<213> Pseudomonas aeruginosa

<400> 495
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<210> 496
<211> 659
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<213> Pseudomonas aeruginosa

<400> 496
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cggacccgca aggggatcga gctgatcccg ctggaagagg tgatcttctt cattgccgac 480

cacaagtacg tgaccttgcg ccatgcgcag ggcgaggtgc tgctggacga gccgttgaag 540

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<210> 497
<211> 629
<212> DNA
<213> Pseudomonas aeruginosa

<400> 497
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cgtccgttcg tggcgatcat ggactggctg ggcaaactgt tgggctccca cgcccgcacc 180

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cagatggtgc tgcagcaggc attgcccatg accttgaagg gactcgacaa ggcgagcgag 300

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cggcgcgaaa tcaccgacca gttgcatcag gtaatgagcg aggtcgcact gttgcgccaa 600

gcggtagaga gcgaggtcag cagagtatc 629

<210> 498
<211> 332
<212> DNA
<213> Pseudomonas aeruginosa

<400> 498
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gtggtcaccc gccagaacat ggacgacttc ggcctcaaca acatcgacga cgtcatgcgc 240

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ggcttctcga tcaacaactt ccagtacgac gg 332

<210> 499
<211> 456
<212> DNA
<213> Pseudomonas aeruginosa

<400> 499
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cgcggtggcc ttgcgcatcg aactcaatgc caagac 456

<210> 500
<211> 275
<212> DNA
<213> Pseudomonas aeruginosa

<400> 500
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ctcggcttcg acaacatcct cggggtcgac tactggttcg gcattcccag cgccttgcgc 180

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ggcgagcagt tgctgcaaca ggtggaggaa atcgt 275

<210> 501
<211> 648
<212> DNA
<213> Pseudomonas aeruginosa

<400> 501
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tgcagcaata catcgactac aagaaggaac tggtgctgct cgaacgcgac ctgccgcgcc 240

tggccgacct cgacgccctg cgccagcggg aagccgcggt gaaagccctg cgcgcgcgga 300

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ccatcgaccg cctgcgcgcc agcctgccgg aagaccagca ggaaagcgtg ctgccgcaac 480

tgcaaagcga actgcagcag cagaccgccg ccctccaggc cgctggcgcc ggcccggaag 540

ccatccgcca gatgcgtcag caactggtgg gcgccgaagc caccacccgc ctggagcaac 600

tcgatcggca acgctcggcc tggaagggcc ggctggacga ctatttcg 648

<210> 502
<211> 405
<212> DNA
<213> Pseudomonas aeruginosa

<400> 502
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caggaagcct ggcagttccc gcagggaggc atcaatgatc gcgaaacgcc ggaagaggcg 120

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tggtaccccc tgggacaggt ggtgaccttc aagcgcgagg tctac 405

<210> 503
<211> 542
<212> DNA
<213> Pseudomonas aeruginosa

<400> 503
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catatccgcc aggcgcgcga ggagatggcg ttgcgcaagc tcgataggcg agcccagcgg 120

cgtgccatcg cgtccttcgg caagggcaag gccggcatcg cccatctgca ggcggaggtc 180

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gagccggcgc tgatcaaacg cgcctatcgc aagctgatca gccagcatca tccggacaaa 480

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tt 542

<210> 504
<211> 427
<212> DNA
<213> Pseudomonas aeruginosa

<400> 504
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gcagcgcgtc agcctgacca ccgatcgcgg cacgctgagc ctgctcagcc cccatggccc 360

gttgttgtgg acgcctgcgg tggcggtacc ggcagaggat gacgacggcc tgttcgcgtt 420

gttcgac 427

<210> 505
<211> 417
<212> DNA
<213> Pseudomonas aeruginosa

<400> 505
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ctacatgcgc atgaaggggg ccgaacggtt gcagcggcac agcctgttcg tcgaggacgg 120

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cctcaggcgg ctcgccgagt ggctcgagcg ctgcttcccc gactgggagt ggcacaacgt 240

gcggatcttc gagaccgagg atccgaacca cctctgggtc gagtgcgacg ggcgcggcaa 300

ggcgctggtc ccggggtatc cgcagggcta ttgcgagaac cactacatcc attccttcga 360

actcgagaac ggccggataa aacgcaatcg cgagttcacg aacccgatgc agaaatt 417

<210> 506
<211> 356
<212> DNA
<213> Pseudomonas aeruginosa

<400> 506
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cttttcgtcg aggacggctg tggcggttta tggaccaccg ataccggctc gcccatcgtc 180

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<210> 507
<211> 671
<212> DNA
<213> Pseudomonas aeruginosa

<400> 507
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actcgaaccg a 671

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<211> 304
<212> DNA
<213> Pseudomonas aeruginosa

<400> 508
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tatc 304

<210> 509
<211> 302
<212> DNA
<213> Pseudomonas aeruginosa

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ccgatccgcg ccagaccttc gaggagatcc agcgtctgac gccctatgtg gaggccgatg 180

ccaggcgccg cgaggcgctc gacttcgaga tctggatggc gctcaaggac aacgcctccg 240

tccagcagca agcgccgacg cctggcgagg aagagcaact gcgcgaatac gcgcaagagt 300

cg 302

<210> 510
<211> 722
<212> DNA

<213> Pseudomonas aeruginosa

<400> 510
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<212> DNA
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<210> 512
<211> 741
<212> DNA
<213> Pseudomonas aeruginosa

<400> 512
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gccgtgggct ttgccagtct gacctactcc tcccggactg ccgagcaatg gcaggaccaa 720

acgcccgata gcgttcgtta c 741

<210> 513
<211> 211
<212> DNA
<213> Pseudomonas aeruginosa

<400> 513
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agttgtaaag gaagttaaag aatggcgtgc t 211

<210> 514
<211> 589
<212> DNA
<213> Pseudomonas aeruginosa

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<210> 515
<211> 710
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<213> Pseudomonas aeruginosa

<400> 515
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caagagctgg agaataaagc ccggtcattg gaagcagaag cccagcgagc cgctgctgag 540

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<210> 516
<211> 752
<212> DNA

<213> Pseudomonas aeruginosa

<400> 516
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tgcaagcacg gctggacaag ctgaacgccg aaacggcaag gcgcaaggaa atcgctcgtc 180

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<210> 517
<211> 739
<212> DNA
<213> Pseudomonas aeruginosa

<400> 517
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atcttgctgt ggacgggtgg tttcccgccg ctggatgtgg ttgggcatgc tgtcgactta 240

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gcggggagtg gttttcttgg tatggttatt ggtgcactag ctattcaggc tgcatggacc 540

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gcttatcagt ttgcctcgcg tcgttatgct agccatctgc gggttacctt gggtgttctg 720

gctatcaaca ctctttggt 739

<210> 518
<211> 756
<212> DNA
<213> Pseudomonas aeruginosa

<400> 518
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cccgggcgca gcacggtgat gctggtcaac ggcgcgatgg cgaccaccgc ctcgttcgcc 120

cggacctgca agtgcctggc cgaacatttc aacgtggtgc tgttcgacct gcccttcgcc 180

gggcagtcgc gtcagcacaa cccgcagcgg gggttgatca ccaaggacga cgaggtggaa 240

atcctcctgg cgctgatcga gcgcttcgag gtcaatcacc tggtctccgc gtcctggggc 300

ggtatctcca cgctgctggc gctgtcgcgc aatccgcgcg gcatccgcag ctcggtggtg 360

atggcattcg cccctggact gaaccaggcg atgctcgact acgtcgggcg ggcgcaggcg 420

ctgatcgagc tggacgacaa gtcggcgatc ggccatctgc tcaacgagac cgtcggcaaa 480

tacctgccgc cgcgcctgaa agccagcaac catcagcaca tggcttcgct ggccaccggc 540

gaatacgagc aggcgcgctt tcacatcgac caggtgctgg cgctcaacga tcggggctac 600

ctggcttgcc tggagcggat ccagagccac gtgcatttca tcaacggcag ctgggacgaa 660

tacaccaccg ccgaggacgc ccgccagttc cgcgactacc tgccgcactg cagtttctcg 720

cgggtggagg gcaccgggca tttcctcgac ctggag 756

<210> 519
<211> 473
<212> DNA
<213> Pseudomonas aeruginosa

<400> 519
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tcttcctcac cggcgccggc caggaaccgc tgcgcggctt gccgaaccac gtgctgcagc 180

gcgcctacgc gccactggga gccttgctgc catcgtgcgc cgggctggtc catccgggcg 240

gtatcggcgc catgagcctg gccttggcgg cgggggtgcc gcaggtgctg ctgccctgcg 300 cccacgacca gttcgacaat gccgaacggc tggtccggct cggctgcggg atgcgcctgg 360

gcgtgccatt gcgcgagcag gagttgcgcg gggcgctgtg gcgcttgctc gaggacccgg 420

ccatggcggc ggcctgtcgg cgtttcatgg aattgtcaca accgcacagt atc 473

<210> 520
<211> 459
<212> DNA
<213> Pseudomonas aeruginosa

<400> 520
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gtccatggca cctatcccaa ggcctggctg gagcgatacc agatgcagaa ctacggggcc 120

gtggatccgg cgatcctcaa cggcctgcgc tcctcggaaa tggtggtctg gagcgacagc 180

ctgttcgacc agagccggat gctctggaac gaggctcgcg attggggcct ctgtgtcggc 240

gcgaccttgc cgatccgcgc gccgaacaat ttgctcagcg tgctttccgt ggcgcgcgac 300

cagcagaaca tctccagctt cgagcgcgag gaaatccgcc tgcggctgcg ttgcatgatc 360

gagttgctga cccagaagct gaccgacctg gagcatccga tgctgatgtc caacccggtc 420

tgcctgagcc atcgcgaacg cgagatcctg caatggacc 459

<210> 521
<211> 519
<212> DNA
<213> Pseudomonas aeruginosa

<400> 521
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aaggggcgaa aatcaaggat ctgattaagc gctatcagta tattggttcg caaatcccgg 120

cagcaatcat gattcgtggt gtgcaggaag agatcaaaaa atccacgaac actgccttgg 180

ccaatgtggg ggcaattgtc gatggcgaac tggcgtatct tgctagccag aaaaaggaaa 240

aattaaatcc tgccgaggcg acacccttgc agatggcctc tgctgaaaag gccgcggcgg 300

tggaactgct tgcgtccaaa cagaaggaac tggctgacgc acgaaccatt gcaaatgcat 360

tctttggcta tgaccctctc acggtcaatt atgttaatgt aatgaatgaa atctacggcc 420

gccgcgaaga taaagatttc agtttcgaca actggtcgaa gtcttattca gccgcacaaa 480

agatccgctt gatcgaagcg aaaatcagcg tcctcaata 519

<210> 522

<211> 417
<212> DNA
<213> Pseudomonas aeruginosa

<400> 522
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atcggccacg agaagccttc gaacatcaag gtgttcatcc acgaactgaa cgccggtaac 120

cagctcagcc acatgtcgcc gatctacacc atcgagatgg gcgacgagtt gctggcgaag 180

ctggcgcgcg atgccacctt cttcgtcagg gcgcacgaga gcaacgagat gcagccgacg 240

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aagcgctgga gcgaatgggc cagcggcaag gtgttgtgcc tgctcgaccc gctggacggg 360

gtctacaact acctcgccca gcagcgctgc aacctcgacg atacctggga aggcaag 417

<210> 523
<211> 573
<212> DNA
<213> Streptococcus pneumoniae

<400> 523
actcttggct tgattttggg tgactctaag ctgatacctg ggtcaggagt gaacattgaa 60

aagtatcctg tgcaacagta tccaaatggt ggaaatggaa ttcaaggaga aacaatcgtt 120

tttaatttta ttggtaggat attaaaagaa aaaggtatag atacttatct ggctgctgcc 180

caaattatta agagtcgata tcccaaaaca gagtttaata ttattggctt tatagaaccg 240

acagagagta attatgaact taaaatttgt gacttagaaa aaaaaggaat cgtttattat 300

ttgggacaac aaaaagatgc gatacctcat attacccgtt cccatgcaat tatccatccc 360

agtgtgtatg gtgaaggaat gagcaatgta ttactagaaa acgctagttc aggacgtgtt 420

ttaattacga cagataatcc aggttgcaaa gaaattgtta aagatagaga gacaggctat 480

atatttcaag gggaaatgt tgaggaacta gtctctatat tggaagtttt tttaggtcta 540

gaaaatgaaa aacgaaaaga gatgggactt caa 573

<210> 524
<211> 535
<212> DNA
<213> Streptococcus pneumoniae

<400> 524
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caaggatctt acttttcatt attttttaaa atttggaaag aatgtaactg tcgaacagga 120 atctaatgct aaattaatct taggaaaaaa gattagagta aacgccgggg gagtattgaa 180

agttagaaaa ggagcaaaac tcaagatttc tgatgatgta tttttgagta ataattgtat 240

gatagcttgt cgtaaataca tagatattaa atctggagta aaatgtggtc ctggagtact 300

tatatatgat catgactatg atgttagtgt tccaggtgga ttgaaagcaa aaaaatttaa 360

gacggcccca gttatgattg gagaaaatgt ttggattgga gctaacagca ttgtcttgaa 420

gggagtgagt attggtgaga atagtgtggt tgcagcagga agtgttgtaa caaaggatat 480

tccagctgat actatattta ttcagaaacg tttatcaagg gagatgaaat tatga 535

<210> 525
<211> 691
<212> DNA
<213> Streptococcus pneumoniae

<400> 525
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aaggatatca taaagcgaac tttattaata aatttatccc tatagaaggt ctacatcagg 120

ttctatttgg tcaaaataaa aataagatta ttgaaggaat gattgatagc gacttaatag 180

ttgttcgtat tccgtctata attggatcaa aaactgcaga ctacgcattg aagataggta 240

agccgtatct gacagaaata atgggggatg cttgggattc ttactggtat catagtttaa 300

agggaaaatt attagctcca tatatatacg ccaaaactaa atcaattgta aaaaacgcta 360

attattgcat atacgtgaca gaaaaatatt tacaagatag atatcctaat attaaatcta 420

atatcgttgc ttcaaatgtt aatattacct ctgtagagaa tagatctttg aagagccgtc 480

tttataagtt gaaaaaattt aatcctcaaa aaatttcaat aatgacaaca gcatctgtga 540

atgtacgagc caagggccat agatttgtat tggaagcaat gaagagatta gaaatacaag 600

gtattttgtt ggattattat ttagcaggtg atggtgatca aagtttctta aaaaagaaag 660

cagaggaatt gggagtagcg aatagaatcc a 691

<210> 526
<211> 509
<212> DNA
<213> Streptococcus pneumoniae

<400> 526
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acttaaaggt ggagctatta aggaagaggt tccgatactg gttgttgctt ttaatgaagc 120 agaggttgca aaattgttta gtaacactta cttggcaact cgcgtacgtt attttaatga 180

gatagataca tatagcgagg taaaagggct taatcccaag acaattattg atattgtttg 240

ttatgatcct agaattggat catactataa taaccctagc tttggttacg gagggtattg 300

cttaccaaaa gacacaaagc aattgaaagc aagttttagg gatgttcctg aaaatctgat 360

tacagctgtg gtgcaatcta ataaaacaag aaaagattat atagctggag ctattctagc 420

taaacaacct agtgttgtag gtatttatag attaattatg aaatctgatt ctgataattt 480

tcgttctagt gctgttaagg gagttatgg 509

<210> 527
<211> 695
<212> DNA
<213> Streptococcus pneumoniae

<400> 527
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ttgtaaaact ttgtcatgat tttaatgaaa aattagaaaa taatatgact ccaattcaat 120

gttattacac tcctgttcct ggcaagagaa atgctatcct ctttgggctg gagcatgtgg 180

attcgcagag tgatattaca gttctagtag atagtgatac agtatggacg cctagaacct 240

tgagtgagtt gctgaagcct tttgtttgcg ataaaaaaat aggtggggta acgacaagac 300

aaaaaattct tgaccctgag cgtaatctcg tgacaatgtt tgctaacttg ttagaggaaa 360

ttagggcaga aggaactatg aaagcaatga gtgtgactgg taaagtaggg tgcttacctg 420

gtcgaacaat tgcttttaga acagagattc tcagagagtg tatacatgag tttatgaatg 480

agactttcat gggatttcat aaggaagttt ctgatgatag aagtcttaca aatttgactt 540

taaaaaaagg ctataaaact gttatgcagg atacttctgt tgtgtataca gatgctccta 600

caagttggaa aaagttcatt agacagcaac taaggtgggc agaaggttct cagtataaca 660

atctaaagat gactccttgg atgattagaa atgcc 695

<210> 528
<211> 542
<212> DNA
<213> Streptococcus pneumoniae

<400> 528
tcgtcatctg tactggtctg ggcttgcttg taggaggatt tttcctgcta aaaccagctc 60

cacaaacacc tgtcaaagag acgaatttgc aggctgaagt cgcagctgtt tccaaggatt 120 tggtatccga aaaggaagtg aacaaggaag aaaaggaaga accccttgaa caagatctaa 180

tcacagtaga tgtcaaaggt gctgtcaaat cgccagggat ttatgacttg cctgtaggta 240

gtcgaatcaa tgatgctgtt cagaaggctg gtggcttgac agagcaagca gacagcaagt 300

cgctcaatct agctcagaaa gttagtgatg aggctctggt ttacgttcct actaagggag 360

aagaagcagt tagccaacag actggtttgg ggacagcttc ttcaataagc aaggaaaaga 420

aggtcaatct caacaaggcc agtctggaag aactcaagca ggtcaaggga ctgggaggaa 480

aacgagctca ggacattatc gaccatcgtg aggcaaatgg caagttcaag tcagtagacg 540

ag 542

<210> 529
<211> 545
<212> DNA
<213> Streptococcus pneumoniae

<400> 529
gtggaaatct gctggtaaag ttctaataat ttgcggaatc tttggatttt ggtttgtttt 60

tcaaaattgg caacagagtc aagcgagtca aaatctggcg gattctgttg aaagggtacg 120

gattctgcct gacactgtta aggtcaatgg tgatagtctg tcctttcgcg gcaaggctga 180

tggacgcatt tttcaagtct attataaact ccagtccgag gaggagaaag aagcctttca 240

agctttaacc gacctgcatg agataggact agaagggaag ctttcggagc cagaagggca 300

gagaaatttt ggtggcttta attaccaagc ctatctgaag actcagggaa tttaccagac 360

tctcaatatc aaaaaaatcc agtcacttca aaagattggc agttgggata taggagaaaa 420

cttgtccagt ttacgtcgaa aggctgtggt ttggattaag acgcactttc cagaccctat 480

gcgcaattac atgacaggac tcttgctggg acatctggac accgactttg aggagatgaa 540

tgagc 545

<210> 530
<211> 402
<212> DNA
<213> Streptococcus pneumoniae

<400> 530
gattatcgga gaaattcgtg acagcgagac ggcgcgtgca gtggtcagag ctagtttgac 60

aggtgcgaca gtcttttcaa ccattcacgc caagagtatc cgaggtgttt atgagcgtct 120

gctggagttg ggtgtgagtg aagaagaatt ggcagttgtt ctgcaaggag tctgctacca 180 gagattaatc gggggaggag gaatcgttga ctttgcaagc agagattatc aagaacacca 240

agcagccaag tggaatgagc aaattgacca gcttcttaaa gatggacata tcacaagtct 300

tcaggctgag acggaaaaaa ttagctacag gctaagcaaa aaaatatcat caccctattt 360

aacaatctct tttctagcgg ttttcatctg gtggagacta tc 402

<210> 531
<211> 463
<212> DNA
<213> Streptococcus pneumoniae

<400> 531
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aaatgatgga aagtttggga tgttcaagtg ctattgtcac tcagttatcc ctagctgaag 120

ttcatggcaa tctccacctg agtttgggaa agatagaaga atatctggac aatctggcta 180

aggtcaagaa aaaattgatt gaagtagcga cctatccctt gattttgctg ggttttcttc 240

tcttaattat gctggggcta cggaattacc tgctcccaca actggatagt agcaatattg 300

ccacccaaat catcggtaat ctgccccaaa tttttctagg catggtaggg cttgtttccg 360

tgcttgccct tttagcactc actttttata aaagaagttc taagatgagt gtcttttcta 420

tcttagcacg ccttcccttt attggaatct ttgtgcagac cta 463

<210> 532
<211> 322
<212> DNA
<213> Streptococcus pneumoniae

<400> 532
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ggtggtcttg ctgattatca gcgtgctttt cttgctcttt gtacctaatc tgaccaagca 120

aaaagaagca gtcaatgaca aaggaaaagc agctgttgtt aaggtggtgg aaagccaggc 180

agaactttat agcttagaaa agaatgaaga tgctagccta agaaagttac aagcagatgg 240

acgcatcacg gaagaacagg ctaaagctta taaagaatac catgataaaa atggaggagc 300

aaatcgtaaa gtcaatgatt aa 322

<210> 533
<211> 380
<212> DNA
<213> Streptococcus pneumoniae

<400> 533
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tctgtccagt ccactttttc agcggtagag gaacagattt tctttatgga gtttgaagaa 120

ctctatcggg aaacccaaaa acgcagtgta gctagtcaac aaaagactag tttgaacttg 180

gatgggcaga tgattagcaa tggcagtcaa aagttgacag ttcctaaagg aattcaggca 240

ccatcaggcc aaagtattac atttgaccga gctgggggca attcgtccct ggctaaggtt 300

gaatttcaga ccagtaaagg agcgattcgc tatcaattat atctaggaaa tggaaaaatt 360

aaacgcatta aggaaacaaa 380

<210> 534
<211> 547
<212> DNA
<213> Streptococcus pneumoniae

<400> 534
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cagtctggtg attttgacag gcggtttggg ggcaactgag gacgacctaa ccaaacaaac 120

cctagctaaa tttttaggga aagcattagt ctttgatcct caggctcagg agaagttgga 180

tatctttttt gccctgcgac cagactatgc ccgaacaccg aataacgaaa gacaagctca 240

aattgtagaa ggagcgattc cactgccaaa cgaaacagga ctggctgttg gaggaaaatt 300

agaagtagac ggagtgacct atgtcgtcct tccaggtccg ccaagtgaat tgaaacccat 360

ggtcttaaac caacttctac ccaagttgat gacagggagc aagctgtatt cccgagttct 420

tcgtttcttt gggattggcg agagccagtt ggttacgatt ttggctgatt taattgataa 480

tcagatcgat cctaccttgg ccccttatgc caagacagga gaagtcactc tacgtctgtc 540

aacaaag 547

<210> 535
<211> 520
<212> DNA
<213> Streptococcus pneumoniae

<400> 535
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ttaatagtac tataagatat atttttttct ttgcaatagc tataagtgta ttaaactttt 180 ttatagcgga acggtttagt atctctagaa gaggaatggt atacttctta actttagaag 240

gaatatcctt atacttgtta aatttcttag taaagaaata ttggaagcat gtgtttttta 300

atccaaaaaa tagcaagaaa attttactgt taacagtaac ggaaaatata gaaaaagttc 360

ttgataaatt gctagaatct gatgaacttt catggaaact ggtagcagta agtgttttgg 420

ataaatctga ttttcaacat gataaaatac ctgtaattga aaaggaaaaa attattgaat 480

ttgcaacgca tgaagttgtg gatgaggtgt ttgtcgatct 520

<210> 536
<211> 210
<212> DNA
<213> Streptococcus pneumoniae

<400> 536
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gattcttgct ttcaaaattt tgagaaagga acgccctgat attatcgtct catcaggggc 120

agctgtagca gttcctttct tttatctagg gaaaatattt ggtgctaaga cagtctatat 180

agaagtattt gatagaattg atgctccgac 210

<210> 537
<211> 405
<212> DNA
<213> Streptococcus pneumoniae

<400> 537
tgagggattt attcaggatg atgtttttat tcaaacagga tactctaatt atgttccaaa 60

attttgtaaa tgggaaaaat taatatctta tgaaaaaatg aatcaattga ttaaggaatc 120

agatattatc attacccatg gcggtccagc tacgtttatg gcagttattg ctaaaggtaa 180

aaatccaata attgttccgc ggctaaaaaa atttggtgag catgtaaatg atcaccagat 240

gcaatttgta aaaataacga aagaaatata caatttaata gttatagatg atatttcaga 300

cttacattta attcttcata attttaagga caaacatttt gaaacttatt tgaataacga 360

gagatttaat gtacgtttca atgtggaaat cagtaacctt tttaa 405

<210> 538
<211> 622
<212> DNA
<213> Streptococcus pneumoniae

<400> 538
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aatagcagta ttttttata attattattt gaaaatgcca atcaatattg acaggataaa 240

gagatatatg tattataatt ttactatctt agttgttttt gtcggtttat tctatataca 300

aagaggctcc aatgtaattt tgtttggaag aagtttgtta gactgggacg gatttacatt 360

agctactagt tatggtgtaa gatatacagg ttttttagaa tacgcaactt taaatggtca 420

gttaattctt tttttattac cgttaattag attgtttaga tttagatttt ttacacaaac 480

tatcattttt gcttttcttc tagaggtttt ggtactaagc aaatctagaa tagcgattgt 540

tgcaatgctt atatatatag catttgcagt agtcaatgag attaattcaa acaataaatg 600

gcttattgga attttctgtc ca 622

<210> 539
<211> 687
<212> DNA
<213> Streptococcus pneumoniae

<400> 539
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aaaatgctgg tttcgctcga ggtaataatg tagcatatca gtttgctaag gaaaagtaca 180

aacctgattt tatggttatc atgaataatg atattgagat agaaacagaa gagtttgaaa 240

aaatcgtgac agatatctat cggaaggaaa aattccattt gttaggacca gatatctttt 300

cgacgacgta tcagcttcac caaaacccaa aacggttgac gcattatact tatgaagagg 360

ttaaggctct caatgaaaaa tttaagaaag ggagccaagt tagtctagca ttaaaaatta 420

aatgttggtt gaagtctagt aaagttcttc ggacagcaat ctatcaaaat aggcgtaaaa 480

agaaatcagt agactataga aaacaggtag aaaacccaat tcttcatggt tcgtttattg 540

tatattctag agatttaatt gagaaagagg agtatgcttt taatcccaat accttcttct 600

attatgaaac agagatatta gattatgaag ctgagttaaa aggatataag agaatttata 660

caccgaagat taaggtcttg caccatc 687

<210> 540
<211> 534
<212> DNA

<213> Streptococcus pneumoniae

<400> 540
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atcggctcat tgatatccaa ttctggaaaa tagctcttac tattatagtt gacctcatta 120

ttctatatct ttataggaga gagattcata atcttgcact tagccatggt tatacgggtt 180

caaattttca gtggttcttt agaaatgcta ccagttatga aggtgagcta acagtgcgaa 240

cttcgattcg ggtcctcatt cgtatcattg acgtatctgc ttatattttt ggatatactt 300

ttattaataa tttcttcatt tatagtcata aacgctctaa agatttactg ctcttagttc 360

cattcttgat ttttatttct aaaaccttat tatctggggg tagattggat attataaaaa 420

ttttaattgc gtatgttgta atggcctata ttcagcaaaa acgaaaagtt ggctgggata 480

aggtcatctc ccataaatat atgagacttg gttttgtagg cttgatagct ggga 534

<210> 541
<211> 450
<212> DNA
<213> Streptococcus pneumoniae

<400> 541
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acaacacaaa gagatggtta gtcctgtttt agatttattt ggtgttgtac cagattatga 120

tttagaaatt atgaaggcta accaaacctt gttctctatc acaactagta tcttggaaaa 180

gataaaacca gttttagaga aggaacaacc agatattgtc ctagttcacg gtgacactac 240

gacaacttat gcagcagcct tggcagcatt ctatttggga attaaagtag gacatgttga 300

agctggtttg cgaacgtaca atttacaaag tccatttcct gaagaattta acaggcaatc 360

gacatcaatc attgcaactt accattttgc tccaactgag ttggctaaag aaaatctctt 420

aaaagaaggt agagagaatg tttatgtgac 450

<210> 542
<211> 565
<212> DNA
<213> Streptococcus pneumoniae

<400> 542
gaagcatacg acaaacttcc aagtgttttc aaagatagaa ttatcgctgg gaaatatcag 60

gttcttactt atcaatactg tgatacgttg cattgctact ttcctcgact attcctttta 120

gcagatgaaa gaaaacgttt gggcttgcca cgaaatacca atctaggatt gcatttgatt 180 gatatcattc ctttagatgg agcaccaaat cattcggttt taagaaagat ttacttttgt 240

aaagtatact ggtatcgttt tttagcaagc ttaggaacaa cttatgttgg cgaccatgtg 300

gatatgcatt ccactaagca aaaactaatt attggtttct ttaaaaaact aggatttgca 360

aaactatttc ctcaaaattc tgtatacaga cgcttggata atctctatag aaagtatgat 420

tggaaaaagc agaagtatgc ggggactatc aatgcttctt tatttgctaa agaagttatg 480

ccagtagaga tttggggaga aggagtagag aagccttttg aggatacctt ctttaaagtt 540

ccaacggagt atgatcgcta cctga 565

<210> 543
<211> 662
<212> DNA
<213> Streptococcus pneumoniae

<400> 543
gtgatagtga acttgggatt gtctagtatt attcagtaca tttcttattt tatgttgatg 60

ttgtgtgtat ttttaacatt aattaagaat actctcaacg tgtttgcaaa tagaatcata 120

tatttttga ttatttcatt tttgtttatt attgggatta atttacaaaa tcttccatta 180

tcaagaaaga tttatttatc attctctatg ttaattattt ctagcttatc caccttaccg 240

ataaagctaa taaataatct cagtgattta agaaggatat catattactt attgcacagc 300

atatttttat ctgtattttt aggtttggtt ttttaaaatat ctttagtaac agttgctgta 360

gagggaattg gcttttcata tggttttaat ggaggtttga ctcataaaaa tttttatgca 420

attacaattt tagtttccta tattctacta tatgtcagca gaaaatatga cgctaaacat 480

cagattgata gttttgtatt atggttagat cttttttttac ttttaatatc taatacgcga 540

acagtttata taatactagt tgtttttttgg attattatta atagaaattt tataaataat 600

attaaaaaag agcatagact ggtagtgaca gcaacgacaa tagtcatctc tttactggcg 660

tt 662

<210> 544
<211> 380
<212> DNA
<213> Streptococcus pneumoniae

<400> 544
agagcaaaaa cgctggtttc tcaacaggtc aaccttggtt ggcggttaat ccaaattacg 60

agatgatcaa cgtacaagaa gcgctggcaa atccagattc tattttctat acctatcaga 120 aactggtcca aattcgcaag gagaatagct ggctaattcg agctgacttt gaattgcttg 180

atacggctga taaggtcttt gcttatatac gtaaggatgg cgaccgtcgc ttcctagttg 240

tggctaactt gtccaatgaa gagcaagact tgacagtaga aggaaaagtc aaatctgtct 300

tgattgaaaa caccctagct caagaagtct ttgaaaaaca aatcttagtt ccatgggatg 360

ctttctgtgt ggaattacta 380

<210> 545
<211> 610
<212> DNA
<213> Streptococcus pneumoniae

<400> 545
acgaacagtg gacctgatac atggtccgat tcttccctcg ctcttaagct tcacctttcc 60

aatcttgcta tcaaatattt ttcaacagct ctataacact gctgatgtct tgattgttgg 120

acgatttctt ggtcaagaat ccttggctgc agtaggagcg acgacagcga tttttgacct 180

gattgtaggc tttacacttg gtgttggcaa tggcatgggg attgtcattg ctcgttatta 240

tggggctcgg aatttcacta aaatcaagga agcagtagca gccacctgga ttttaggtgc 300

tcttttgagc attctagtta tgttgctggg ctttcttggc ttgtatcctc tcttgcaata 360

cttagatact cctgcagaaa ttcttcctca atcttatcaa tatatttcta tgattgtgac 420

ctgtgtaggt gtcagctttg cttataatct ttttgcaggc ttgttgcggt ctattggtga 480

cagtctagca gccctgggat ttctgatttt ctctgccttg gttaatgtgg ttctggatct 540

ctattttatt acgcaattgc atctgggagt tcaatccgca ggacttgcta ccattatttc 600

gcaaggttta 610

<210> 546
<211> 546
<212> DNA
<213> Streptococcus pneumoniae

<400> 546
ttgtcttgac tggttgtgtc aatgtcgata aaaccacagg tcagccaaca ggatttattt 60

ggaataccat cggagcccct atggctgaag ctatcaagta cttcgctact gataaaggtc 120

taggctttgg tgtcgctatc atcatcgtaa ccattatcgt gcgcttgatt atcttgccac 180

ttggtatcta ccaatcatgg aaggcaacgc ttcactctga aaagatgaac gccctcaagc 240

acgtccttga gccacaccaa acgcgtctca aagaagcgac tactcaagaa gaaaaactcg 300 aagcccaaca agctctcttt gctgctcaaa aagagcacgg tatcagcatg tttggcggtg 360

taggatgttt ccctatcctc cttcaaatgc ctttcttctc tgctatctac tttgctgccc 420

aacatactga aggggttgct caagcaagct acctaggcat tcctctaggt tctccaagta 480

tgattttggt tgcctgtgct ggtgtccttt actatcttca atcgctcctt tcacttcacg 540

gagtag 546

<210> 547
<211> 262
<212> DNA
<213> Streptococcus pneumoniae

<400> 547
tgcaaaaggt tagaatgatt gcccaaggta gggtacaggg agtcggcttt cgttggggtg 60

tttacagctt ggcacttgaa attggtggca tcacaggtcg agtatggaat aacgacgatg 120

gcacagtgga aatcttagcc caagcagact catctgctat catggcaaaa tttatccaag 180

aaatccgaaa aggaccgaca cctttttcaa aagtaagcta cttagatgtc aaactaagca 240

actttcctcc ctactctgac tt 262

<210> 548
<211> 629
<212> DNA
<213> Streptococcus pneumoniae

<400> 548
gttcggtaat ccagttgaag tcccttttga acattgggaa ctagaacatt gaattccaat 60

tctccatccg aagacttggc ttcaatctgt gaagctgagg gaactaaatc ctcgtttgaa 120

gcgtagtaaa gggttacacg gtaacggaca cgcttgtttt ggtccaaggc tttacgcacc 180

ttgctttcat agtagttttg accagtcgaa tactcggctt gtgcctgatt tgcccaggct 240

gtctgaacag caatgttttt aggattgctt gttgaggcat caaaaccatc caaaccaccg 300

attaaggcat agcctaacaa atgacctcta tcgactgcat gggtataaga gccctttaga 360

ttcttgacct gatgccaacc tggaggagtc caagaagttg aaccattccc agtttcttta 420

cgattcttgt actgacgagt ggccttagac aagagggcat tagctacggt tggaacagtt 480

tccttgccca ctgtctttgt tttattgtca gcgtagggct tacttgaaac cttggcatct 540

agatttgttt tattaccatt gacgataaaa gcacctgagc cattccactc cagactcccc 600

tttatttgac tcttgactgc gtctgttaa 629

<210> 549
<211> 323
<212> DNA
<213> Streptococcus pneumoniae

<400> 549
cgtggaaatt ttagaagaac tcttcccagg ctacgaaaac acgtggcgtt cttcccaaga 60

gcctgcccgt aaaggctatg ctggaaccat gttcctttat aagaaagaac ttacacctac 120

tatcagcttc ccagaaatcg gtgccccttc taccatggac ttggaaggtc gtatcatcac 180

tctagaattt gatgcatttt tcgtaaccca agtttacact ccaaacgctg gtgacggtct 240

caaacgcttg gaagaacgcc aagtctggga tgccaaatat gctgagtatt tggctgaact 300

agacaaagaa aaaccagtcc ttg 323

<210> 550
<211> 206
<212> DNA
<213> Streptococcus pneumoniae

<400> 550
aaaatttggg ggattcagtt agctgcaatt aaaaaaattg gtgttttgag ggaagaacgt 60

ataagcccca atcagctttg gcatgcactg gaaacagatt atgccggaga agaaggtaag 120

gtcattcaag aaatgttgat tcatgatgca cctaagtatg gtaatgatga tgattatgct 180

gacaaattgg ttactgctgc ttatga 206

<210> 551
<211> 510
<212> DNA
<213> Streptococcus pneumoniae

<400> 551
cctctaaggc tatgatggaa aagattgctg ttgctaagtc aaggacggta gaagaagatc 60

agacaaaagt ctgtgtaact cgctacggca atgttctatg tagtcgtggt tctgtgattc 120

ccctatggat tgatcaaata aagcaaggga atcctataac gattacggaa cctagtatga 180

ctcgttttat tatgtcctta gaagaagcgg tagacctagt tctgtttgct tttgaaaaag 240

gaaaaacagg agatatccta gtacagaaag caccagcatg taccattgaa gtgttggcgc 300

aagctgttac ggaacttttt gcacctaatc aagatattaa agtaatcggg attcgccacg 360

gtgaaaagat gtatgaaacg ttgttgacta ctgaagaatg tacgaatgcc attgatttag 420 gcggctttta tcgtgtgcct agcgataatc gagatcttaa ctatgataag tatttcaacg 480

aaggggatgc caaacgcaat cccttaatag 510

<210> 552
<211> 589
<212> DNA
<213> Streptococcus pneumoniae

<400> 552
tgaaagatgg acgagatagg actcgtccta atttagagat tggagagatt tttcagtatg 60

atcgtgatac agatccgatt ttattagatg aatattgtaa gaaggccgat ttcgtattcc 120

atttagctgg tgtcaatcgt ccacagaatc ctgatgaatt catggaggga aattacggtt 180

tttcaagtag attattggag attttagaaa agtatgaaaa cacttgtcct gttctactct 240

caagttctac tcaagctagt ttagaaggcc gattttcaaa ctctatatat ggacaatcta 300

agctagtagg ggaagaactc ttctttgaat atggaaagaa aacgggagca cctgtcttag 360

tttaccgttt cccgaatctt tatgggaagt ggtgccgtcc taactacaat tctgctgtag 420

caactttctg tcataatcta gctcacgatt tacctattca agtaaatgat ccaagtgtag 480

aattggagtt gctgtatatt gatgatttga tacaagagtg tctaactgca ttggaaggaa 540

atcctcatcg ttgtaatcta gatggattac aaatcttacc tagcccatc 589

<210> 553
<211> 545
<212> DNA
<213> Streptococcus pneumoniae

<400> 553
tacatggatg ctgttggaga tgatcttggt gctactgtag ggaatattat taatacttca 60

tacaaattga tgaatcaaat taaaccagat gctttattga ttttagggga tacaaattct 120

tgtttatcag ctattactgc caagcgttta catattccaa tttttcatat ggaggctggc 180

aatcgctgta aggatgagtg cctgccggaa gagactaatc gtcggattgt tgatattatt 240

tcagatgtta acttagcata ctctgaacat gcacgtaagt atttacatga gtgtggttta 300

cctaaagagc gcacatatgt aacaggttct cctatggcag aagtgttaca taaaaattta 360

tctgccattg agtcttcaga tatccatgaa cgtttgggat tgaaaaaagg aggttatatc 420

ttactttcag ctcaccgtga ggaaaatatt gatacagata aaaattttat ttctctcttt 480

acagcaatta atcaattagc tgaaaagtat aatatgccaa tcttatattc ttgccatcct 540 agatc 545

<210> 554
<211> 250
<212> DNA
<213> Streptococcus pneumoniae

<400> 554
catatggtac atttgattta ttgcattatg gtcatatcaa tcttttgaaa cgtgctaaac 60

agctaggtga ttatttgatt gtagttgttt caagtgatga gtttaattta aaagaaaaga 120

ataaagtatg ttactttaac tacgaacaca gaaaaaattt agtagaagct attcgatatg 180

tcgatttagt aatccctgaa actagttggg aacagaaaaa gtcagatgtt aaagactacc 240

atattgacac 250

<210> 555
<211> 283
<212> DNA
<213> Streptococcus pneumoniae

<400> 555
ctcctagtgc cctatatctt tgaatttcct gcggatgatg ccctgcgtct caaggaaaga 60

atgcctctct tagaggaagt gggcgtcttt ctagcagagt acggagaaaa tcaatttatt 120

ctacgtgaac atcctatttg gatggcagaa gaagagattg aatcaggcat ctatgagatg 180

tgcgacatgc tccttttgac caaggaagtt tctatcaaga aataccgagc agagctggct 240

atcatgatgt cttgcaagcg atctatcaag gccaatcatc gta 283

<210> 556
<211> 284
<212> DNA
<213> Streptococcus pneumoniae

<400> 556
cttggtgcac agagtcctca aaaatcaatt tcagaacaaa cagcttatga aattgatgaa 60

gaggttcgtt cattattaaa tgaggcacga aataaagctg ctgaaattat tcagtcaaat 120

cgtgaaactc acaagttaat tgcagaagca ttattgaaat acgaaacatt ggatagtaca 180

caaattaaag ctctttacga aacaggaaag atgcctgaag cagtagaaga ggaatctcat 240

gcactatcct atgatgaagt aaagtcaaaa atgaatgacg aaaa 284

<210> 557
<211> 627

<212> DNA
<213> Streptococcus pneumoniae

<400> 557
aagtaggcga tggttatgtc tttgaggaga atggagtttc tcgttatatc ccagccaagg 60

atctttcagc agaaacagca gcaggcattg atagcaaact ggccaagcag gaaagtttat 120

ctcataagct aggaactaag aaaactgacc tcccatctag tgatcgagaa ttttacaata 180

aggcttatga cttactagca agaattcacc aagatttact tgataataaa ggtcgacaag 240

ttgattttga ggctttggat aacctgttgg aacgactcaa ggatgtctca agtgataaag 300

tcaagttagt ggaagatatt cttgccttct tagctccgat tcgtcatcca gaacgtttag 360

gaaaaccaaa tgcgcaaatt acctacactg atgatgagat tcaagtagcc aagttggcag 420

gcaagtacac agcagaagac ggttatatct ttgatcctcg tgatataacc agtgatgagg 480

gggatgccta tgtaactcca catatgaccc atagccactg gattaaaaaa gatagtttgt 540

ctgaagctga gagagcggca gcccaggctt atgctaaaga gaaaggtttg acccctcctt 600

cgacagacca tcaggattca ggaaata 627

<210> 558
<211> 784
<212> DNA
<213> Streptococcus pneumoniae

<400> 558
gcatctctcg ttatgtcttt gcgaaagatt taccatctga aactgttaaa aatcttgaaa 60

gcaagttatc aaaacaagag agtgtttcac acactttaac tgctaaaaaa gaaaatgttg 120

ctcctcgtga ccaagaattt tatgataaag catataatct gttaactgag gctcataaag 180

ccttgtttga aaataagggt cgtaattctg atttccaagc cttagacaaa ttattagaac 240

gcttgaatga tgaatcgact aataaagaaa aattggtaga tgatttattg gcattcctag 300

caccaattac ccatccagag cgacttggca aaccaaattc tcaaattgag tatactgaag 360

acgaagttcg tattgctcaa ttagctgata agtatacaac gtcagatggt tacatttttg 420

atgaacatga tataatcagt gatgaaggag atgcatatgt aacgcctcat atgggccata 480

gtcactggat tggaaaagat agcctttctg ataaggaaaa agttgcagct caagcctata 540

ctaaagaaaa aggtatccta cctccatctc cagacgcaga tgttaaagca aatccaactg 600

gagatagtgc agcagctatt tacaatcgtg tgaaagggga aaaacgaatt ccactcgttc 660

gacttccata tatggttgag catacagttg aggttaaaaa cggtaatttg attattcctc 720 ataaggatca ttaccataat attaaatttg cttggtttga tgatcacaca tacaaagctc 780

caaa 784

<210> 559
<211> 502
<212> DNA
<213> Streptococcus pneumoniae

<400> 559
gaccattacc actttattcc ttacagcaag ctttctgcct tagaagaaaa gattgccaga 60

atggtgccta tcagtggaac tggttctaca gtttctacaa atgcaaaacc taatgaagta 120

gtgtctagtc taggcagtct ttcaagcaat ccttcttctt taacgacaag taaggagctc 180

tcttcagcat ctgatggtta tatttttaat ccaaaagata tcgttgaaga aacggctaca 240

gcttatattg taagacatgg tgatcatttc cattacattc caaaatcaaa tcaaattggg 300

caaccgactc ttccaaacaa tagtctagca acaccttctc catctcttcc aatcaatcca 360

ggaacttcac atgagaaaca tgaagaagat ggatacggat ttgatgctaa tcgtattatc 420

gctgaagatg aatcaggttt tgtcatgagt cacggagacc acaatcatta tttcttcaag 480

aaggacttga cagaagagca aa 502

<210> 560
<211> 462
<212> DNA
<213> Streptococcus pneumoniae

<400> 560
tttcatttct tatttcctcc aaaatactct cgggaacata gcaggcaata tcctgaccaa 60

acttcaaaag ctctctaacg cctgatgaac tgatatagag atgttcaggt cgactatgta 120

aataaatagt ctctatatca gaagacagct gatgattgta gtaatcaaaa ctggcttcat 180

attgcaaatc cgacgcattc ctcaaaccac gcactagaca agtagcaccc aatctttttg 240

caacatcgac caccaattca tcatgagaag ccacgacttc aacattttcc agatgtccca 300

aagccttttc tagcccccgt ttacgatttt cgataggaag aaatccttgt ttgtggggat 360

taaaaaaaat acccacataa agcttatcaa aaagtctgct cgcccgttca atgatatcca 420

gatgcccatt tgtcatcgga tcaaatgagc ctgtgaataa gc 462

<210> 561
<211> 508

<212> DNA
<213> Streptococcus pneumoniae

<400> 561
gatttctgta tgaggcagtt cgcgattgac tgcaaattta tcattgtttt cacagagtga 60

accaaccaca tctaccgctt cagctggtcc atctggatgg gtcacgttgc taatatgatg 120

gtaagctccg tacatagctg gacgcatgag gttgactgct gaggcatcca cacctagata 180

ggtacggtag gtttccttct tatgagtgac tcttgtgact agagcaccgt gaggtgccag 240

cataaaacga cccaattcgg tgaaaatctt gacctgacca agacctgctg acgtaagaac 300

ttcttcatac accttacgaa ctccctcacc aatcaaggcg atatcgttcg gctcctggtc 360

tggacgataa ttaacaccaa taccgccaga aagattgata aagtctagcc aaatgcccaa 420

cttttccttg atttcaacag ccagttcaaa gagctgacga gccaactctg gataatagag 480

atgggtcacg gtattggacg ctaggaag 508

<210> 562
<211> 652
<212> DNA
<213> Streptococcus pneumoniae

<400> 562
ggctgttagt ccaagtcaag aactatttgg aaagatcaaa gtaaaggaag ttcgttattt 60

gaaggaattt agaaatttaa attctaagga tgcaagggaa tatgacttgg ctttattaat 120

tctagaaaag cccattggtg caaaattagg gactttgggt cttcctacta gtcaaaaaaa 180

tttgacagga ataactgtga ctatcacagg ctatccatca tataatttta aaattcatca 240

aatgtataca gataaaaaac aagttttaag tgatgatggc atgttcttgg attaccaagt 300

tgatacttta gaggggtcta gtggatctac agtttatagt gctagtcacc gtgtagtagg 360

agtgcatact ttaggagatg gagctaatca aattaacagt gcagttaaat taaatgaagc 420

aaattgccat ttacttattt attcggttct taaaggttac tctcttgaag gatggaagaa 480

aataaatggt agttggtact attatagaca acatgataaa caaacgggtt ggcaggagat 540

aaatgatact tggtattatt tagacagttc cggtaagatg cttacagatt ggcaaaaagt 600

aaatggaaac tggtattatc tcaattcaaa tggagcaatg gttacaggta gc 652

<210> 563
<211> 250
<212> DNA
<213> Streptococcus pneumoniae

<400> 563
cttgtgctgt tcttcgttga tttccttgat atccaaaaga accaagtcag tgacagccat 60

gagtttgtca aacttctcaa ggtaacgcgg tttattacgg aaaggaagag cacaggtgtc 120

caaggtacag tggattcctt gttccttagc cttggtgaag agagcaatca ggaaatcaat 180

ctgcaagaga gcttctcctc cactgactgt aatcccaccc ttatttcccc agaaaccacg 240

gtagcgcaag 250

<210> 564
<211> 500
<212> DNA
<213> Streptococcus pneumoniae

<400> 564
ttgatatcca acaactacaa aaagacgaag taaacaatat tacatatttt gctgaaaatg 60

ctgctggcga agactgggat ttatcagata atgtcggttg gggtccagac tttgccgatc 120

catcaaccta ccttgatatc atcaaaccat ctgtaggaga aagtactaaa acatatttag 180

ggtttgactc aggggaagat aatgtagctg ctaaaaaagt aggtctatat gactacgaaa 240

aattggttac tgaggctggt gatgaggcta cagatgttgc taaacgctat gataaatacg 300

ctgcagccca agcttggttg acagatagtg ctttgattat tccaactaca tctcgtacag 360

ggcgtccaat cttgtctaag atggtaccat ttacaatacc atttgcattg tcaggaaata 420

aaggtacaag tgaaccaatc ttatataaat acttggaact tcaagacaag gcagtcactg 480

tagatgaata ccaaaaagct 500

<210> 565
<211> 525
<212> DNA
<213> Streptococcus pneumoniae

<400> 565
aggaaacaga aaataaagag aaacataaag atattcataa tgctatagaa acttcaaagg 60

atactgaaga aaagaaaaca acaattattg aggaaaaaga agttgttagt aaaaatcctg 120

taatagacac taaaactagc aatgaagaag caaaaatcaa agaagaaaat tccaatcaat 180

cccaaggaga tcatacggac tcatttgtga ataaaaacac agaaaatccc aaaaaagaag 240

ataaagttgt ctatattgct gaatttaaag ataaagaatc tggagaaaaa gcaatcaagg 300

gactatcaaa tcttaagaat acaaaagttt tatatactta tgatagaatt tttaacggta 360 gtgccataga aacaactccg gataacttgg acaaaattaa acaaatagaa ggtatttcat 420

cgattgaaag ggcacaaaaa gtccaaccca tgatgaatca tgccagaaag gaaattggag 480

ttgaggaagc tattgattac ctaaagtcta tcaatgctcc gtttg 525

<210> 566
<211> 250
<212> DNA
<213> Streptococcus pneumoniae

<400> 566
cattgaaacc aggagaaaag gtagcagaag ctaagaagaa ggttgaagaa gctaagaaaa 60

aagccgagga tcaaaaagaa gaagatcgtc gtaactaccc aaccaatact tacaaaacgc 120

ttgaacttga aattgctgag ttcgatgtga aagttaaaga agcggagctt gaactagtaa 180

aagaggaagc taaagaatct cgaaacgagg gcacaattaa gcaagcaaaa gagaaagttg 240

agagtaaaaa 250

<210> 567
<211> 280
<212> DNA
<213> Streptococcus pneumoniae

<400> 567
aaaagcgaaa gttaagagtg aacaagctga ggctacaagg ttaaaaaaaa tcaagacaga 60

tcgtgaacaa gctgaggcta caaggttaga aaacatcaag acagatcgtg aaaaagcaga 120

agaagctaaa cgaaaagcag aagcagaaga agttaaagat aaactaaaga ggcggacaaa 180

acgagcagtt cctggagagc cagcaacacc tgataaaaaa gaaaatgatg cgaagtcttc 240

agattctagc gtaggtgaag aaactcttcc aagcccatcc 280

<210> 568
<211> 414
<212> DNA
<213> Streptococcus pneumoniae

<400> 568
aagatattgc caacctcaac atcgatggct tggttcttga catcaatatt agttaccttc 60

aagagtgact tgtagtcaaa ctgcttttca cgttcttctt gggcattgtc cgcaaagacc 120

gctacacctg ccagttctga gtcgaactcg cgcaagagac taatcatacc gttgaccgtt 180

ccgccacctt tcaagaagtc atccacaatc aagacacggc tgcctgcctt aagactacgt 240

tttgaaagga acattttctc gatacggtca ccacttgaac ctgaaacata gttgacgcta 300 acagttgaac cttcggtaat tttcaggtca cggcgcacaa tgacaaaaga gacattgagg 360

acattggcaa ctgcatttgc aagtggcaca cccttagttg ctacggtcat aacc 414

<210> 569
<211> 312
<212> DNA
<213> Streptococcus pneumoniae

<400> 569
gcttgtatga cgatagagga gttagaagag gtcaaaaact cagcggcagg aacctttgtt 60

actaagacag cgaccttgga cttccgtcag gggaatcctg agccacgcta ccaagatgtt 120

ccacttggtt ccatcaactc tatgggcttg ccaaataatg gcttagacta ttatttggat 180

tatcttttgg atttgcagga aaaagagtcg aaccgaactt tcttcttatc tctggtcggc 240

atgtctccag aggaaaccca tactattttg aaaaaagtcc aagagagtga ttttcgtggt 300

ctgactgagc ta 312

<210> 570
<211> 599
<212> DNA
<213> Streptococcus pneumoniae

<400> 570
ttgtagggct aggaacaggt tctactgcct attattttgt cgaagaaatc ggtcgtcgaa 60

tcaaggaaga aggcttgcag attacagctg tgacgacttc tagtgtgacc agtaaacagg 120

ctgaagggct caatatcccg ctcaagtcta ttgaccaagt agactttgtc gatgtgacag 180

tcgacggggc ggatgaagtg gatagtcagt ttaatggaat caaaggcggt ggtggtgccc 240

ttctcatgga aaaggtggtc gcaacaccat caaaagaata catttgggtg gtggatgaaa 300

gcaagctggt cgaaaaacta ggtgctttta aattgccagt agaagtggtt cagtatggtg 360

cagagcaggt ctttcgtcat tttgaacgag ctggctacaa accaagtttc cgtgaaaaag 420

acggccaacg ttttgtgacc gatatgcaga attttatcat tgacctcgcc ttggatgtca 480

ttgaaaatcc aattgctttt ggacaagaat tggaccatgt cgttggtgtt gtggagcatg 540

gtttattcaa ccaaatggtg gataaggtaa tcgttgctgg acgagatgga gttcagatt 599

<210> 571
<211> 450
<212> DNA
<213> Streptococcus pneumoniae

<400> 571
atgacgcgct atgctttgct ggtgagaggt atcaatgttg gtggtaagaa taaggtcgtc 60

atggcggagc ttcgtcaaga attgacaaac ttgggactgg aaaaggttga gagctacatc 120

aatagtggca atattttctt tacttcgata gattccaaag cccaattggt tgaaaagcta 180

gagactttct ttgcagtcca ttatccattt attcagagct tttctttact gagtctagag 240

gactttgagg cggaacttga aaatctacca gcttggtgga gcagagactt ggcacgaaaa 300

gattttctct tttacactga gggtttggat gtggaccaag tcatcgcgac agttgaaagt 360

ttagagctga aagatgaagt gctttatttt ggaaaacttg ggattttctg gggggaaattt 420

tctgaagaat cctattctaa gactgcctat 450

<210> 572
<211> 527
<212> DNA
<213> Streptococcus pneumoniae

<400> 572
aaccatgtat tgaggaaagt gacaactttc agtgctccta aagtgattac ttccagaact 60

gtttggaatg ctaagaatgg tttctgggat gttggtttgg aaagtcgtaa attagctgtt 120

agtggaaaaa ttaagcatta tgtggttgat aatgacaatg ttgtgactcc cttgattcat 180

aataatcgtg atattgttac atttacaggt aattcacgct ttaaacaccg ttctcgtggc 240

tattttgaaa gtccaatgaa tgatattcct aactttaata ttggtaaaca agctaccttg 300

gataaacatg gttatcgtga tccgaaattg gataaagtgc gattctttaa gaaacaggct 360

ctgcctcgat cttctagtca accaagcgct gaaccaatgg aaaatattgc ctcaggaaaa 420

caggttactc aaagttcgac agctttcgga ggagatgcta gaagagctgt ggatggcaaa 480

gtcgatggta actatggtca caattctgtc actcatacaa acttcca 527

<210> 573
<211> 561
<212> DNA
<213> Streptococcus pneumoniae

<400> 573
ggacttcctt ttcttatcca gaaattgatc tagctctctc tgatttcgaa gaatagtgac 60

tttatgtgaa tattcttggc aaagtttttg gtaattttct ttttgagttt tgctacgccc 120

atcccaaaga atccatctga taaactccca ctcaaagcgt tcagggcaat ctaccgccat 180 actttctctg acttttccac ggtatttaag ataacgctta aaggctctaa agagacaggt 240

caatggcgaa aaattgagaa agatgatttg gtcagcttct tgcattcgtt cttggtagta 300

gcaccaagaa taattaccat cgatgaccca agctttatgc ttggtgagaa agttttttat 360

ctcggttaac atccattcgc agtcactgtc ttgccaacca ggttgaaatt ggagtgtgtc 420

catgtgcagt tttggaatgg agtagtagtt agataacttt tctgctatag ttgacttacc 480

agaaccagaa tatccgataa ttgcgatttt cattttctac cttttcctat ttggagacaa 540

aaaaacagcc tctatggact g 561

<210> 574
<211> 503
<212> DNA
<213> Streptococcus pneumoniae

<400> 574
tttgcagatt tgtgagattg atactgatcc agacctgatg ggcaaaggac tccacttccc 60

caatcggcat ctgagtaaaa cgataatagt agctatcagg gtcgttttgg gctagactca 120

gcattttcaa gaaacggtcc agataccaac tttcaatatc atccactcca gcatctacat 180

agatggaaaa gtcaaagaag tcagtgatat agagacgatc gttttgtgga ttttgaaaga 240

cattgattcc ctcaacaatt acaaaatcag cagctttgac actttgtttc tcttcgggta 300

cgatgtcgta aacttcatga gaatagacag gaatatctac atcttgtcca tttttgatgc 360

ggtccaagaa gttgagaaga gcttccatat catagctttc aggaaatcct ttacgattta 420

aaatcccctg ctcaatcaag gtttgattgg gatagagaaa accatcagtt gtaaccaact 480

caaccgtagc atctgtaaac gta 503

<210> 575
<211> 501
<212> DNA
<213> Streptococcus pneumoniae

<400> 575
aatagcagta gcagggacag gttatgtggg tttatctatt gcaattctat tagcgcaata 60

tcataaggtt atagcggtag atgttattcc tgaaaaagta gagcttatca atcgtcgcca 120

atctcccatt aaggatgatg atattgaaac ttatttagtg gaaaaggaat tagacttagt 180

tgcaacatta gatggtaatg aagcttatcg agatgctgac tttgtcataa ttgctgtccc 240

aactaactat gacagtaaaa aaaattattt tgatacatct gttgtggaag cagttattga 300 gcagattatt gcggttaatt tgaaggcaac aattgtcata aaatccacaa ttcctgtggg 360

atatacagaa agtctccgaa cacgttttgg gcaatttaag attctcttta gtcctgaatt 420

tttacgggag tctaaagcac tttatgataa tctctatcct agtcgaatca tcgttggagc 480

agatttgaga gatacggagc a 501

<210> 576
<211> 200
<212> DNA
<213> Streptococcus pneumoniae

<400> 576
atgaatttaa catttttagg cttatgtatt gcctgtatgg gcgtatctgt cggtgaaggt 60

ttattgatga atggactgtt taaatcagta gcacgccaac cagatatgct ttctgagttt 120

cgtagtttga tgtttttagg tgttaccttt attgaaggaa ctttctttgt aactcttgtc 180

ttctcattta ttatcaaata 200

<210> 577
<211> 300
<212> DNA
<213> Streptococcus pneumoniae

<400> 577
atgagtgaaa taggctttaa atacagtatt ttagcgtcgg gttccagtgg aaattctttt 60

tatctggaaa cctcaaaaaa gaagctttta gtagatgcag gcttgtctgg caagaaaatt 120

accagtctgc tagctgaaat taaccgtaag ccagaagacc tggatgccat cttgattacc 180

catgagcatt cagatcatat ccatggagta ggcgttttgg ctcgcaagta tggtatggat 240

ctttatgcca atgaaaagac ctggcaagct atggaaaata gtaaatatct tggcaaggtg 300

<210> 578
<211> 550
<212> DNA
<213> Streptococcus pneumoniae

<400> 578
ttgcacttta tatcctccat tattttgtct tttatatcag tgattatgga caggatttct 60

ttaaaagggg atatttgatt gaacttgtcc agacattgaa atatatccta ttctttgcac 120

tagcgattag tatttctaat tttttcttag aggatcgatt tagtatttcc agacgaggca 180

tgatttactt cctcacatta catgctctct tagtctatgt gctaaaccta tttatcaagt 240

ggtattggaa gcgggcttat cccaacttta aaggaagtaa gaagattctc ctacttacag 300 caacttctcg tgtcgaaaag gtactggata gattaataga atcaaatgag gttgttgggg 360

agttggtagc cgtcagtgtc ttagataaac cagattttca gcatgattgt ttaaaggtag 420

tagcagaggg ggagatagta aactttgcga ctcatgaggt ggtcgatgaa gtctttatca 480

atcttccaag taaaaaatac aatattggag agcttgtctc tcagtttgaa acgatgggaa 540

ttgatgtaac 550

<210> 579
<211> 345
<212> DNA
<213> Streptococcus pneumoniae

<400> 579
aagtaggggc tttcttgcga aaaacatctt tggatgaact accacaattg tttaatattc 60

ttgttggtaa tatgagtatt gtaggtccta gaccagcggg tataaatgaa ctagatttga 120

ttgcagagag agataagtat ggagcaaatg atatcttgcc agggttaact ggatgggcac 180

aaattaacgg gcgtgatact ttgtctgttg agatgaagac ggagttagat ggctactatg 240

ttaaacatct gtctttgata atggatatta gatgtatagt taagacaata ccttacgtac 300

tgaaacgaaa aggtattgta gagggtagtg gtaagaaaga aagtt 345

<210> 580
<211> 600
<212> DNA
<213> Streptococcus pneumoniae

<400> 580
taacgagatt attacaaaac aaaactacta tcgtatttct ttttctggta aaggaaaatt 60

aagtaagata ttaggttatg taaaattcag aaaagaaatt aaaaagaagc taaaagaaaa 120

tgattatgat atgatattgc cgttacatag tattgtgtct ttcattttag tagattttct 180

tctcttttca tttaaaaata gatatattta tgatattcgt gattacagtt atgaaaaatt 240

tttggtttat cgtttggttc agaaacaatt ggtgaaaaat tctttaatga atatcgtttc 300

ttcagacggc tataaatttt ttttaccaat gggagagtat tttactaccc ataacctacc 360

caatatgata gaattaaacg aggtaaagca gttaaaaaat aatagtacgt ttccaattca 420

actttcctac attggtttaa ttcgttttca agaacaaaat aaaaaaataa tcgatttttt 480

tgcaaatgac agtcgatttc agttgaattt tataggtact aatgcaggag aattaaggga 540

attttgtcaa gaaaaaaata tcagcaatgt taacttggtg gacacattcc agcctaaaga 600

<210> 581
<211> 561
<212> DNA
<213> Streptococcus pneumoniae

<400> 581
gaaagaattg ggtgcaaagg tttatcatgt gcctctatta aggaaaaagc ctctacatca 60

gtttctctct cttgctagaa taataaagaa aggagattat gatatagttc attgccatgg 120

ctataaatct gcaattggtc tgatcttatc taaaataatt ggttgtaaaa ttagaattat 180

tcatagtcat atggcttatg taacagaaaa cagttttcaa aaagtattgc gtaaattagt 240

aacaattttg gtaaaaatct tagcaactca ttggtttgca tgtggggaag attcggctaa 300

gtggttatat ggagagaaag cgtataaaga cggaaaaatt gaaattattt ttaatgcaat 360

tgatttgaaa aagtatcaat tttgtcaga tgttagagaa aaatgtcgta gagaattaga 420

tgtgtcaaat aagttcgtat taggaaatat agctcgccta tcagatcaaa aaaaccaaag 480

ttatttattt aacgttttaa aagaactcat tttaatcaaa ccaaatgtta ttttactcct 540

agttggtaat ggtgaggatg a 561

<210> 582
<211> 736
<212> DNA
<213> Streptococcus pneumoniae

<400> 582
gcttccatca aatcacttta cactactaat tcagatttgg atttaaattt atggattatt 60

gctgataaag tttcggatag aaataaagaa aagataaata gattatcaaa acaatttgcg 120

cagagagaaa ttaattggat agagaacgtt gagatcccat ttaaattaca tttagatagg 180

ggatcaatta gttcatttag cagattattt ctgggaagtg ttcttccatc ttcaatgagt 240

aaagttcttt atcttgacag tgatattatt gttatggatt ctttacgaag tatttttgat 300

attgatttta agggtaaaat tctctatggg gtgaatgata cttttaataa agaatacaag 360

caggtgttgg gtataccaat tgacaagcca atgtttaatg ctggagttat gcttattaat 420

ttagagttat ggagaaataa taacgtcgaa gaaagatttt tgcaagtaat tcaaaagttt 480

aatggtacta tattacaagg agatttaggg gttttaaatg cagttttata taactcattt 540

ggtgtacttc ctccagaata taattatatg accatatttg aagatttgac ttatgaagaa 600

atgatagttt ttaaaaaacc aattaattat tattcaaaag aggaaattaa aaatgccaga 660 gaacgtatag tcttacgaca tttcacaact agttttttat caaaaagacc ttggcaagaa 720

ggcagtaatg ttgcac 736

<210> 583
<211> 525
<212> DNA
<213> Streptococcus pneumoniae

<400> 583
tggaagacct ttatcctgtc ttttaacagt tcctttcgtg aaaacaaata ttactcccaa 60

tcaaatatct tatttatcta taattccttt gattgttgga tttataataa tgatatttac 120

aactgatttc gttgtattat tactggcatg gtttctattt tttttatgga acttactaga 180

tggagtagat gggaacttag ccagatatcg ggagcaatac tcgaaggatg gaagtgtagt 240

agatgcaatg gctggctatg tagccatggt gttgacgtat ttcggtgcag gaatagtagc 300

tgctcattta aacgactcag atatctatat aattttgggt gcattatctg ggatttcatt 360

gatttttcca aggttagtga tgcataagta tatcaataca gtagctcaag atgagtctgt 420

gagtagcatt aaagataaat ctgattttaa tactataaaa atactggctc taaacatgac 480

atcaattaca ggaattccgc aggttttact gctattaact atttt 525

<210> 584
<211> 596
<212> DNA
<213> Streptococcus pneumoniae

<400> 584
ctataatggt gagcgatatt tgtcacaaca gattgatagt attaggtctc aaacattcac 60

taattggacg ctttttatta gggatgatgg atcaaaagat aaaacaatag aagtaataca 120

gaggtattct aagatagatg atagaattag attcgttgaa aatccctcaa agtttcatgg 180

agcttattac aatttttttta atctaattga atacgttaaa aacaattatc aatttgatta 240

ttactttttt tgtgatcaag atgatatttg gaaagagcac aagttagaaa tacagctgtt 300

aagattttct aaagatgaca tgccagagat ggtttactct gatatgtcaa cgattgatgc 360

cagtaataat ttgatagata ttagtataaa taaaataatg gggattgaat taccgaacat 420

aaataatttg tattttattc atgcctatat ctgggggtgt actgcaggtt ttaatcatgc 480

attgctagag atggttcctt cagttgatat tgataaagat tatttatata tagaaaaact 540

gtctcatgat aattattttg caaagtttgc actagagtat gggaaggtgt tgttct 596

<210> 585
<211> 530
<212> DNA
<213> Streptococcus pneumoniae

<400> 585
cgtatcaagt cggcattttc aaactttggg tatgcaaaat aatttttggc tggcagagaa 60

tgtggaattt ctggaatttg gattacctcg aaatgatgat ttttttaaaa gtgaaaaaat 120

caaaaccaca aatataaaat ttagaacatt atttgatatc gatttagacg aactggtagt 180

tttgtatatg ccgacgttca gagatgatgg atcgttgaat gcctataatt tagattactc 240

gaaactaata catgtttttc aaaataaatt tagaaaaaat gtaaaaatat tagttcgttt 300

tcatccaaat gttgattcta gttttataaa tttacaggat acagactgta taaatgtgtc 360

gacctattca aatcctcagg atctgatgat gagtgcagat gtgatgatta cggattattc 420

atcggcttct attgatttta tgttattaaa tcgtccagta tttctgtatt taccagatta 480

tcaaagttat gtgaatgata gaccattgga tgataacttt gataaattgc 530

<210> 586
<211> 380
<212> DNA
<213> Streptococcus pneumoniae

<400> 586
ggatatgcca gcaaaaacgt tagccagcaa agttcaagtg gctgtaccag ctgacactcg 60

tatcgtctca atctctgtca aggataaaca gccagaggaa gccagtcgta tcgctaattc 120

tctacgagaa gttgctgcag aaaagatcgt cgctgtaacg cgagtatctg atgtaacgac 180

acttgaagaa gcgcgaccag ctacgactcc ctcttctcca aatgttcgac gcaattcctt 240

gtttggtttt cttggaggag cagtcgtaac agtaattgct gttcttttga ttgagttgct 300

cgacacccgt gtgaaacgtc ctgaagatat tgaagatgta ctgaaaattc cacttttagg 360

gctcgttcca gattttgaca 380

<210> 587
<211> 290
<212> DNA
<213> Streptococcus pneumoniae

<400> 587
atcaacgact tccaccaata tcgcttgggc ttttgcgcgt gcaggttaca aaacgttgct 60

gattgatgga gatattcgca attctgttat gttaggtgtc tttaaagcaa gggataagat 120

tacaggcctg acagaatttt tatcaggaac tacagaccta tcacaagggc tttgtgatac 180

caatatcgaa aatctctttg taattcaggc tggctctgtg tcaccgaatc cgacagctct 240

tcttcaaagt aagaatttca gtacaatgct tgaaaccttg cgtaaatatt 290

<210> 588
<211> 507
<212> DNA
<213> Streptococcus pneumoniae

<400> 588
agattacact tttacagcta tctccctcag ctacttaacc agtattattg ttgcctttag 60

gcagggagga cttagtcaat ttatcttgat actaacagat gatagtttca atggttcggt 120

actagaaatg catgaagttg cacctattac agctctcttt attctgtact atttgtacaa 180

atattttata aaagaaaata gtttttcttc agtattttat aatatcttaa tagctctcat 240

tattcttttt ttaagcctta aacgaatcgt tcttttgagt gtattaatta tcataccagt 300

atttttggta atttattggt atgataaaaa agtaagtaaa ctagggaaag aacgaaaaat 360

tttaagttta ttaaatatct tttccttaat atttataaca ggaatattcc tttatgttta 420

tagtgtaaaa tctgatttta tatatacatt tattcaagaa cataatatta attcgatggc 480

tagaacagat ttatggaagg gagttga 507

<210> 589
<211> 558
<212> DNA
<213> Streptococcus pneumoniae

<400> 589
tctggactct cgataattgg aataatggtt ttcttatatc taattatgtt ccgtctatat 60

ttatatgggt ttgctttcta attatttttc aaattactgg ttttatttta caaaaagtta 120

gtatatatga tttttctgta tggtatctga ttttatctta ttttttttatg tttggattaa 180

ttttcaatga gtatatgggg tttcaaacaa ctctgctgtg gagccctagt aacttctata 240

ataatgaaga attatttcat tcatatattt ttataatttg gattttgttt tgttattctg 300

taggctattt attttttttat agtgatggaa aggtacatta tcattcagaa gtacaaaatt 360

atcaggaaaa tgaagagaaa attttgtaca atgcgggtag gattttaaca ggagtgggct 420

ttatttctag ggtaataact gattctaaaa cagtactagc agttagagcg gcgaatagct 480 attcagcata ttcagaggca gctagttcag gaataataga tgatttagga gtacttatgc 540

ttcctggtgt gttctcct 558

<210> 590
<211> 516
<212> DNA
<213> Streptococcus pneumoniae

<400> 590
acatttgtta tagtttcctt gttgacaaaa ttgtcgtaca ggcctaaagt ggagggaatt 60

tcgcatgaag aattgaaaga aataaatcct tcaaagataa tctatgtcat tcttctgact 120

ctaaatcttg ttatgttatt tctttatatc cgtgaaattc agaaagtagt attgttttca 180

ggtagaagtt tttctaatat tacagatttg ataagtaact ataggtacct atcttattat 240

tcaaatgaag tagaaaatcg tgtaagtgga atgattaatc aactatctaa aattattcca 300

gcgactacac ttatttcttt atatatattt atgaataatt attttataac taaacaaata 360

aagaaaaatt tcatttattt gattccaata gctatattct ttgtctatgc aatcattagt 420

ggtggtagat tgccccttat aaggttagtt gttggagctc tgttgatatt gtatatatac 480

tctgtgtacg ggagtcctaa atctcaactt accaaa 516

<210> 591
<211> 383
<212> DNA
<213> Streptococcus pneumoniae

<400> 591
ttttaaccca ccaagttgac tttagcttga tgcgagagat tggtaaggtt tttgcggaaa 60

aatttgctgc tactggcatt accaaggtcg taaccattga agcgtcgggt attgccccag 120

ccgtttttac agctgaagcc ttaaacgttc ccatgatttt cgccaaaaaa gctaagaaca 180

tcaccatgaa cgaagacatc ttaactgctc aagtctactc ctttaccaag caggtgacca 240

gcaccgtttc tatcgctgga aaattcctct caccagagga caaggttttg attatcgacg 300

atttccttgc taatggccaa gctgctaaag gcttgattca aatcatcgaa caggccggtg 360

ccacagtcca agctatcggt atc 383

<210> 592
<211> 723
<212> DNA
<213> Streptococcus pneumoniae

<400> 592
gtggatgctc aagaaactgc gggagttcac tataaatatg tggcagattc agagctatca 60
tcagaagaaa agaagcagct tgtctatgat attccgacat acgtggagaa tgatgatgaa 120
acttattatc ttgtttataa gttaaattct caaaatcaac tggcggaatt accaaatact 180
ggaagcaaga atgagaggca agccctagtt gctggtgcta gcttagctgc tctgggaatt 240
ttaatttttg ctgtttccaa gaaaaaggtt aagaataaaa cggtattaca tttagtattg 300
gttgcgggaa taggaaatgg tgtcttagtt tcagtccatg ctttagaaaa tcatcttttg 360
ctaaattaca atacggacta tgaattgacc tctggagaaa aattacctct tcctaaagag 420
atttcaggtt acacttatat tggatatatc aaagagggaa aaacgacttc tgattttgaa 480
gtaagtaatc aagaaaaatc agcagccact cctacaaaac aacaaaaggt ggattataat 540
gttacaccaa attttgtaga ccatccatca acagtacaag ctattcagga acaaacacct 600
gtttcttcaa ctaagccgac agaagttcaa gtagttgaaa aacctttctc tactgaatta 660
atcaatccaa gaaaagaaga gaaacaatct tcagattctc aagaacaatt agccgaacat 720
aag 723

<210> 593
<211> 465
<212> DNA
<213> Streptococcus pneumoniae

<400> 593
attatcactg gcggaaagac ccataattag gtttttctc gcacattgtt gggaacggtt 60
gcatcatgca ggtaggacct gttgataatg gtgcctggga cgttgggggc ggttggaatg 120
ctgagaccaa tgcagcggtt gaactgattg aaagccattc aactaaagaa gagttcatga 180
cggactaccg cctttatatc gaactcttac gcaatctagc agatgaagca ggtttgccga 240
aaacgcttga tacagggagt ttagctggaa ttaaaacgca cgagtattgc acgaataacc 300
aaccaaacaa ccactcagac catgtggatc cataccctta cttggcaaaa tggggcatta 360
gccgtgagca gtttaagcat gatattgaga acggcttgac gattgaaaca ggctggcaga 420
agaatgacac tggctactgg tacgtacatt cagacggctc ttatc 465

<210> 594
<211> 452
<212> DNA
<213> Streptococcus pneumoniae

<400> 594
aatggaatga acggaagtga agctgctgtt catgaagtgc cagaatacac aggcccatta 60

gggacatccg gcgaagagcc agctccaaca gtcgagaagc cagaatacac aggcccacta 120

gggacatccg gcgaagagcc agccccgaca gtcgagaagc cagaatacac aggcccacta 180

gggacagctg gtgaagaagc agctccaaca gtcgagaagc cagaatttac agggggagtt 240

aatggtacag agccagctgt tcatgaaatc gcagagtata agggatctga ttcgcttgta 300

actcttacta caaaagaaga ttatacttac aaagctcctc ttgctcagca ggcacttcct 360

gaaacaggaa acaaggagag tgacctccta gcttcactag gactaacagc tttcttcctt 420

ggtctgttta cgctagggaa aaagagagaa ca 452

<210> 595
<211> 526
<212> DNA
<213> Streptococcus pneumoniae

<400> 595
ggtcaactgt ccatatctcc tatttttcaa ggaggttcat atcaactgaa caataagagt 60

atagatatca gctctttgtt attagataaa ttgtctggag agagtcagac agtagtaatg 120

aaatttaaag cagataaacc aaactctctt caagctttgt ttggcctatc taatagtaaa 180

gcaggcttta aaaataatta cttttcaatt ttcatgagag attctggtga gataggtgta 240

gaaataagag acgcccaaga gggaataaat tatttatttt ctagaccagc ttcattatgg 300

ggaaagcata aaggacaggc agttgaaaat acactagtat ttgtatctga ttctaaagat 360

aaaacataca caatgtatgt taatggaata gaagtgttct ctgaaacagt tgatacattt 420

ttgccaattt caaatataaa tggtatagat aaggcaacac taggagctgt taatcgtgaa 480

ggtaaggaac attacctcgc aaaaggaagt attggtgaaa tcagtc 526

<210> 596
<211> 506
<212> DNA
<213> Streptococcus pneumoniae

<400> 596
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ttctgaagga tggcagtttg tccaagaaaa tggtagaacc tactacaaaa agggggctct 120

aaaagaaacc tactggagag tgatagatgg gaagtactat tattttgatc ctttatccgg 180

agagatggtt gtcggctggc aatatatacc tgctccacac aagggggtta cgatcggtcc 240 ctctccaaga atagagattg ctcttagacc agattggttt tattttggtc aagatggtgt 300

cttacaagaa tttgttggca agcaagtttt agaagcaaaa actgctacga ataccaacaa 360

acatcatggg gaagaatatg atagccaagc agagaaacga gtctattatt ttgaagatca 420

gcgtagttat catactttaa aaactggttg gatttatgaa gagggttatt ggtattattt 480

acagaaggat ggtggctttg attctc 506

<210> 597
<211> 518
<212> DNA
<213> Streptococcus pneumoniae

<400> 597
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gatgaagtag aggctgcttt tgaagctttg ataaaaggag tcaaggtagc tcctcagaca 120

gagtggaagc agattttgga caatacagaa gtgaaggcgg ttattttagg gggcgaccca 180

agttcgggtg cccgagttgt aacaggcaag gtggatatgg tagaggactt gattcaagaa 240

ggcagtcgct ttacagcaga tcatccaggc ttgccgattt cctatacaac ttcttttta 300

cgtgacaatg tagttgcgac ctttcaaaac agtacagact atgttgagac taaggttaca 360

gcttacagaa acggagattt actgctggat catagtggtg cctatgttgc ccaatattat 420

attacttggg atgaattatc ctatgatcat caaggtaagg aagtcttgac tcctaaggct 480

tgggacagaa atgggcagga tttgacggct cactttac 518

<210> 598
<211> 534
<212> DNA
<213> Streptococcus pneumoniae

<400> 598
gggtaactat gcgacttctg cttcaagttc ttcatgggat ttagtagcaa ataatcatct 60

gaaaatgacc gacactggaa atgtaacacg aactgcagca catgaagatg cgatagcggt 120

cgcttctgct aaaaatcaaa cagttgagtt tgataaagtt aacataggtg gagaaagttt 180

taaatacaga aatatagggg cctttttcga taagagtaaa atcacaacaa atgaagatgg 240

aacaaaagct cctagtaaat taaaatttgt atatataggc aaggggcaag accaagattt 300

gataggtttg gatcttaggg gcaaaattgc agtaatggat agaatttata caaaggattt 360

aaaaaatgct tttaaaaaag ctatggataa gggtgcacgc gccattatgg ttgtaaatac 420 tgtaaattac tacaatagag ataattggac agagcttcca gctatgggat atgaagcgga 480

tgaaggtact aaaagtcaag tgttttcaat ttcaggagat gatggtgtaa agct 534

<210> 599
<211> 604
<212> DNA
<213> Streptococcus pneumoniae

<400> 599
gatcaacaag ctgaagaaga ctatgctcgt agatcagaag aagaatataa tcgcttgact 60

caacagcaac cgccaaaagc tgaaaaacca gctcctgcac caaaaacagg ctggaaacaa 120

gaaaacggta tgtggtactt ctacaatact gatggttcaa tggcgacagg atggctccaa 180

aacaacggtt catggtacta cctcaacagc aatggtgcta tggctacagg ttggctccaa 240

tacaatggtt catggtatta cctcaacgct aacggcgcta tggcaacagg ttgggctaaa 300

gtcaacggtt catggtacta cctcaacgct aatggtgcta tggctacagg ttggctccaa 360

tacaacggtt catggtatta cctcaacgct aacggcgcta tggcaacagg ttgggctaaa 420

gtcaacggtt catggtacta cctcaacgct aatggtgcta tggctacagg ttggctccaa 480

tacaacggtt catggtacta cctcaacgct aacggtgcta tggctacagg ttgggctaaa 540

gtcaacggtt catggtacta cctcaacgct aatggtgcta tggcaacagg ttgggtgaaa 600

gatg 604

<210> 600
<211> 500
<212> DNA
<213> Streptococcus pneumoniae

<400> 600
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ggctataatg ccctcagtct tgcagaagtt gaagttttct gctttatagc tacgaatgct 120

gaaacggcga cacaagtttc taagccagtt caaccaatca gtcagactcc tgtgaaggat 180

aaaacattga caattcaaca cagtggagct tacattgccc gctactccat aacttgggaa 240

gaagttccag tagataaaga tggaaaccaa gttgttcgta gtcattcttg ggaaggaagc 300

ggtcgcaacc agactgcagg ttttgtcctc aacctcccaa tcaaagaaaa tatgagaaat 360

ctgcgagtta agattgagaa aaagacgggc ctactatgga atagatggca aacaatctat 420

gaaaacagac caattttagc tcaaccccac cgtaaaatta cccattgggg tacgacattg 480 aattccaagg tgagtgacga 500

<210> 601
<211> 419
<212> DNA
<213> Streptococcus pneumoniae

<400> 601
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ctttatagct acgaatgctg aaacggcgac acaagtttct aagccagttc aaccaatcag 120

tcagactcct gtgaaggata aaacattgac aattcaacac agtggagctt acattgcccg 180

ctactccata acttgggaag aagttccagt agataaagat ggaaaccaag ttgttcgtag 240

tcattcttgg gaaggaagcg gtcgcaacca gactgcaggt tttgtcctca acctcccaat 300

caaagaaaat atgagaaatc tgcgagttaa gattgagaaa aagacgggcc tactatggaa 360

tagatggcaa acaatctatg aaaacagacc aattttagct caacccccacc gtaaaatta 419

<210> 602
<211> 401
<212> DNA
<213> Streptococcus pneumoniae

<400> 602
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gttagaaaaa aacggaaaag tgacgcgtcc agctttggga atccagatgg ttaatttatc 120

taatgtgagt acaagcgaca tcagaagact caatattcca agtaatgtta catctggtgt 180

aattgttcgt tcggtacaaa gtaatatgcc tgccaatggt caccttgaaa aatacgatgt 240

aattacaaaa gtagatgaca aagagattgc ttcatcaaca gacttacaaa gtgctcttta 300

caaccattct atcggagaca ccattaagat aacctactat cgtaacggga aagaagaaac 360

tacctctatc aaacttaaca agagttcagg tgatttagaa t 401

<210> 603
<211> 690
<212> DNA
<213> Streptococcus pneumoniae

<400> 603
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tatcctgaag gtaaaacata tgcggattat cggaataaca aaaatagacg agagactata 120 gaaggagtta ctgtttttcg ttcctataca attccaaggg gaaaaagtac tttacatagg 180

atattaaatt attttagttt tgctatcagt tcctcgatag gggttctact gggacagtat 240

aaagcaaaag atggatcaga atttgattgt atttttgtaa atcaatcgtc tccagttatg 300

atggcatggg ctgctatggc ttataaaaat aaatataaga aacctatgtt tctgtattgt 360

atggatgttt ggccagatag tttaactgta ggtggagtga aacaagatgg cttgattttc 420

aagttgttta aatttatatc gaaaaaagtt tatcgagcta gtgattatat atttgttact 480

agtccatcat ttaagaatta ttttgtgaac caatttgaca taacagaaca aaagattact 540

tatttgccac aatatgcaga agatcttttt atccctgatg aatctagagt taataaagaa 600

agtgttgacc taacttttgc tggtaatatt ggcaaagcac aaaatttgga aactattttg 660

aaagctgcca gtttgataga gaagaatacc 690

<210> 604
<211> 588
<212> DNA
<213> Streptococcus pneumoniae

<400> 604
caacttctga ttatgccttt gtggatcctg ttgggagtag tgtctatttt ttctagaatt 60

gacatggaac gatcattcct attttttta ttaacaatag gttgtttaat tagcactatt 120

gctttgttag atatagttac gggagtatct tatgtcttta atggtttgtc tcagcaactc 180

tatttggctg tgggaattct agttttaggc tactggaatg ctgatgtgat tgttcattat 240

tggaaaatca tcaccatgac ttttttggga gcatgtttgc tgatttcagt ggatatttat 300

tttcactact ttcaaggaca tactttttca aatattgatt atgtttatcg agctaagaat 360

tcagcggcat ctatcttttt atcggcagtt attctcaact tgtctctata taatcgcaag 420

tgggcactgt ggagaaaagt attgttatta gctagtagcg gattgctgat ttacatgtgc 480

atccttatgc ggtcacgagc agttctgtta gcagctgcag tacttccgct agtttatata 540

tggtttcagg agacgtcttt ggggcataag attggacgga cattagga 588

<210> 605
<211> 739
<212> DNA
<213> Streptococcus pneumoniae

<400> 605
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ttactcccta tgtcactcga gtcttttctt cagatcattt tgggatttat acttatacca 120

atacagttgc ttcttacttt gttaccttta cattgatggg gataagtatg tatggaagta 180

agaaaatttc tcttaaaaga catgatgaga tagcagtcaa tgatgaatat gcttccttac 240

tgactgtcca gctgcttaat gtaggtctag ccacgttaac ttactttctc tatgtgacct 300

tttttgtcaa taataatcaa gttatttatt ggatccagat gttgtatgtg atttctgctg 360

ttttgatatg acttggtttt tatcaggatt ggaacgtttt cgtgaaattg ctgttcgaaa 420

tatcattgta aatgtcttat cagccctcat gattttttc tttgtgcata cggaggctga 480

tttggctatc tataccttaa taaaggtagg gacgattttt atcagtcaga ttgttatttt 540

tttaccagtt gttcggatgc aacggtttta tcttgcagga gctgaacata ttcgacgtac 600

ctatcgaggc ttgcttttgt tgtttatccc tgttttggca gacacccttt ttcaaactat 660

ggataagatc atgctaggta tctatgcatc ctatactgct gtgggtttgt attactcaag 720

taggatggtt gctgacatc 739

<210> 606
<211> 533
<212> DNA
<213> Streptococcus agalactiae

<400> 606
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tttgttaagt gtagtctcat tatttcttat gtatcgtcac catttttttgg catttagaca 120

cttgaacgtc atttatggag ttgtaattat tttaatcatt ttagcaagtt tatttctttg 180

tattaagaat aaagctagaa tttttacaac tataatttta gtactatcct ctattttcgt 240

tgctactact ttatatggat ttaagtcaac cattgatttg acaaataatc taaataaaac 300

tgcttcatac tctgaaattg agatgagtgt agttgtacca aaagattcta aaataaccaa 360

tatagaagct gtcagcaaat tagccgcacc agttaaaaac gatacttcaa atattactga 420

tttgatagaa catataaaat cagaaaaagg aatctctatt acaccacaaa aaacagattc 480

ttaccaggat gcatacaata gaattaaaaa tggtgatagt caagctatgg ttt 533

<210> 607
<211> 510
<212> DNA
<213> Streptococcus agalactiae

<400> 607